108
108-1 Field Hearing: Field Hear

[H.A.S.C. No. 108–13]

Y 4.AR 5/2 A:
2003-2004/13

# FIELD HEARING ON AIR FORCE SCIENCE AND TECHNOLOGY PROGRAMS

FIELD HEARING

BEFORE THE

TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

OF THE

COMMITTEE ON ARMED SERVICES
HOUSE OF REPRESENTATIVES

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

HEARING HELD
JULY 19, 2003

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# CONTENTS

---

## CHRONOLOGICAL LIST OF HEARINGS

2003

Page

HEARING:
Field Hearing on Air Force Science and Technology Programs ..... 1

APPENDIX:
Saturday, July 19, 2003 ..... 29

---

## SATURDAY, JULY 19, 2003

## FIELD HEARING ON AIR FORCE SCIENCE AND TECHNOLOGY PROGRAMS

### STATEMENTS PRESENTED BY MEMBERS OF CONGRESS

Weldon, Hon. Curt, a Representative from Pennsylvania, Chairman, Tactical Air and Land Forces Subcommittee ..... 1

### WITNESSES

Lyles, Gen. Lester L., Commander, Air Force Materiel Command ..... 14
Nielsen, Maj. Gen. Paul, Commander, Air Force Research Laboratory ..... 18

### APPENDIX

PREPARED STATEMENTS:
  Lyles, Gen. Lester L., and Maj. Gen. Paul Nielsen ..... 38
  Weldon, Hon. Curt ..... 33

DOCUMENTS SUBMITTED FOR THE RECORD:
  [There were no Documents submitted.]

QUESTIONS AND ANSWERS SUBMITTED FOR THE RECORD:
  Mr. McHugh ..... 79
  Mr. Turner ..... 72
  Mr. Weldon ..... 67

# FIELD HEARING ON AIR FORCE SCIENCE AND TECHNOLOGY PROGRAMS

House of Representatives,
Committee on Armed Services,
Tactical Air and Land Forces Subcommittee,
*Washington, DC, Saturday, July 19, 2003.*

The Subcommittee met, pursuant to call, at 8:33 a.m., in the Carney Auditorium, Air Force Museum, 1100 Spaetz Street, Wright-Patterson Air Force Base, Ohio, Hon. Curt Weldon (chairman of the subcommittee) presiding.

## OPENING STATEMENT OF HON. CURT WELDON, A REPRESENTATIVE FROM PENNSYLVANIA, CHAIRMAN, TACTICAL AIR AND LAND FORCES SUBCOMMITTEE

Mr. Weldon. The Subcommittee will come to order.

We are very pleased to be here in Dayton today to join in the centennial of flight celebration by highlighting your rich aviation heritage and the importance of science and technology programs to the future of the Air Force and to our nation's security and economy.

For many of you, it is probably your first attendance at a Congressional hearing. As you well know, in our government, we have three separate and distinct branches. The President spends the money on behalf of the taxpayers but we decide how much to give him and under what terms and conditions.

In the area of defense spending, our Armed Services Committee in the House has the responsibility for the largest discretionary portion of our federal budget dollar. My good friend and colleague, Duncan Hunter, chairs the full committee and we have just now completed the conference process with the Senate on a bill that will authorize approximately $400 billion of your money for our nation's defense.

This particular hearing is a subcommittee hearing which I chair on air and land, so that my portion of the defense budget, which primarily focuses on research and development (R&D) and procurement, oversees those programs within those categories.

Our job is two-fold. Our job is to take the President's request, which comes through the Office of the Secretary of Defense (OSD) as it is developed by the various services; to hold hearings and decide whether or not the amount of money the President and the Secretary of Defense asked for is the appropriate amount of money, and if it is in fact in all the right categories. In the end, we make that decision and we do it collectively as Republicans and Democrats. And then we submit our final package of our spending plan to the White House and the President can either approve it or veto it. And as you know, we can in fact, in the end, override the President's veto.

The second purpose of our hearings, like the one we are having today, is our oversight responsibility—to look at the programs that we fund through our defense budget, to look at perhaps areas that we need to put more focus on, areas that we need to in fact put more money into, to basically learn. And that is the purpose of being here today—to learn.

So we are very pleased to bring this congressional hearing directly to the Dayton community, to the fine folks at Wright-Patterson, and to learn from this hearing.

The science and technology (S&T) community here at Wright Patt has made major contributions in providing the superior advanced capabilities that exist in today's Air Force that make our military as a whole without equal in the world today. You deserve credit and should take a great deal of pride in the world class technology that gives our Air Force the premier systems that it has. The advanced technology demonstrations developed and managed from here directly contribute to several critical enabling capabilities such as Global Hawk and Predator Unmanned Aerial Vehicle (UAVs) with their advanced sensor systems; the Litening navigation and laser targeting pod; and the communications networks that link all of these systems together. But you do much more than that.

Achieving an adequate commitment of resources to fund science and technology programs that provide these kinds of superior capabilities is a perennial Washington battle, both in the Pentagon and on Capitol Hill. The pressure is always on to fund near-term needs and to put off the more abstract and less immediate long-term needs. This is certainly the case today, with our troops deployed around the world in the battle against international terrorism. Because the near term is much more tangible, convincing decision makers to increase the commitment to critical, yet less defined science and technology programs is always an uphill battle. This requires everyone in science and technology to ensure that redundancies among the services be reduced to the maximum extent possible and that resources are applied to technologies that offer the greatest promise to providing future war fighting capabilities. This is a difficult challenge, if nothing else, due to the nature of the scientific process and the complexity of the technologies involved.

The science and technology community needs to work through its professional associations, academic institutions and other organizations to ensure that your legislative representatives realize the importance of what you do and what your contribution has been and continues to be.

And let me say to our friends from the Ohio delegation, you have the best. They are here today, they are outstanding advocates for the outstanding work that you do. If Dave Hobson and Mike Turner hit me over the head one more time to come out here and see what you have, I am going to hit them back over the head. In fact, I want you to know that we had to go up and down Hobson Way five times before we got to this hearing room today.

[Applause.]

Mr. WELDON. I want you to know we stopped the bus and took a photo with all of us pointing up to Hobson Way, and before the end of this year, Mr. Hobson will have an appropriate item that will be in his office that will reflect upon our feelings of having traveled up and down Hobson Way five times.

And by the way, we are still looking for something named after John Boehner and Mike Turner. Someone suggested we will have to find an alley some place for Mike; and John Boehner, I know there must be a school around here someplace that we can name after him.

In 2003, as in 1903, the critical element to scientific innovation and discovery is the self-disciplined, highly motivated scientist and engineer. However, it takes more than a bicycle shop as a venue to provide the necessary tools to support technological innovation and development in the 21st century. As you all know, providing adequate labs and facilities takes major, sustained funding. And the competition for these resources continues to be fierce. That is why we must all work harder to see that adequate resources are made available if we are to be world class providers of aerospace technology in the future.

Much of the renewed vigor in science and technology funding within the Air Force can be credited to "Team Dayton.". Your local leaders as well as your past and present representatives in Washington have been aggressive supporters of the need for increased science and technology program funding.

When I spoke to the Dayton Development Council in Washington earlier this year, I said I am from Pennsylvania, we want to join you, we have been building the country's first smart region by linking the Information Technology Systems (ITS) of Pennsylvania, Delaware, New Jersey and Maryland. A natural extension of that is to link up with Team Dayton and our Ohio friends because you do such great work.

Not that I want to challenge our friends from the west or the south, but think for a moment, when you bring together Pennsylvania, Delaware, New Jersey, Maryland and Ohio, you bring together almost 60 members of the House, 10 members of the Senate. There is not much attention that we cannot get in Washington. So I challenge our friends here to work with us, and Mike has agreed to provide leadership here in this effort to expand what we call the smart region.

Even with the pressure on the federal budget, Air Force science and technology funding will be up over ten percent this coming fiscal year. Mike Turner, Tim Ryan, Dave Hobson, John Boehner, to name a few, have all worked very hard to make sure that we do not short change our technology future by inadequately funding science and technology programs. Sustained commitment is required if we are to maintain U.S. leadership in aerospace technology.

I would like to especially welcome today's witnesses, General Les Lyles and Major General Paul Nielsen. General Lyles is about to end a distinguished career in the U.S. Air Force—35 years. If there is a person that you could point to as an example of what this nation is all about, it is the gentleman sitting in front of us who is about ready to end an extremely distinguished career on behalf of this nation. He has had so many senior leadership positions it would be impossible to name them all. Much of our success in our missile defense program today in defending this country and our allies and our troops around the world can be credited to Les Lyles. I had the pleasure of working with him as the Chairman of the Research Committee for six years and I can tell you there is no more honorable person serving this country than the leader of this community and this command.

[Applause.]

[The prepared statement of Mr. Weldon can be found in the Appendix on page 33.]

General LYLES. Thank you.

Mr. WELDON. And so as we come here today, it is with a sense humility that we sit in front of someone—actually he should be higher than we are, for his service to America. But he knows the respect that all of us have for his tenure. And we have been told that when he leaves office in August, he will become a professional race car driver——

[Laughter.]

Mr. WELDON [continuing]. And he is going to be driving either in the Indianapolis 500 or Pocono or Dover.

General LYLES. Pocono sounds good.

Mr. WELDON. Before we begin, there are members that would like to make opening comments. But first of all, our leader, my friend, the Chairman of the full Committee, an individual who served the country as a veteran in Vietnam, understands and always requires us to focus on that person at the lowest level of our military and what his or her needs are, as they serve America in our most difficult circumstances around the world. He is the Chairman of the full Armed Services Committee, and let me tell you what an honor it is for all of you to have him join this Subcommittee, to come out and spend time when he has so many other duties and responsibilities.

So I am going to ask our distinguished Chairman from California—and we do not hold that against him in the east, do we—to make whatever comments he would like to make and then we will ask other members on the dias also the make whatever opening comments they would like to make. Chairman Duncan Hunter.

Mr. HUNTER. Thank you, Curt, it is great to be with you. And let me tell you, ladies and gentlemen, this is going to be a great hearing because Curt Weldon knows science and technology and air power and this is going to be a great, great hearing.

And let me say I was—I did go to Vietnam, I was volunteered by the University of California with a 1.7 grade average——

[Laughter and applause.]

Mr. HUNTER [continuing]. But it went up a little bit after I got back, but not much.

But it is really wonderful to be with you and to be with this wonderful delegation. You have got a great delegation, you know that when John Boehner and David Hobson come up to us on a regular basis and tell us you listen to that Mike Turner because he is a brilliant guy and he has got a lot of great capability and a lot of great leadership capability, listen to what he says.

And you know, he does have a lot of leadership capability and it is his initiative that has moved us to do this hearing. And it is kind of a neat hearing, this is something we do not do very often. And sitting at dinner last night and again this morning at breakfast, it just was—I was impressed, re-impressed, with the importance of American air power and how central you are and this great institution and this great base and community are to the success of our country on the battlefield.

I was sitting next to the PBY Catalina and I had never seen it before, never seen one. General Lyles said yeah, that is a Catalina, had the open door gunner seats, tail gunner seats in the back where a guy would actually slide that sunroof off and fire at incoming aircraft. That is the aircraft that Ensign Leonard Smith flew when he dove out of the clouds in the early 1940s and almost ran into the Bismarck because we had sent those Catalinas over to Great Britain to help find the Bismarck. And they took a few shots at him and he went back in the clouds, he radioed in the Bismarck's location and Churchill's fleet, what was left of the Churchill fleet, descended on the Bismarck and sunk it.

Last night we were dining under that B–52 bomber, that great aircraft that projected American air power and I remember our old friend Sam Johnson from Texas, prisoner of war (POW) for a number of years in Vietnam, who told about looking out the window in the Hanoi Hilton in Operation Linebacker in 1972, December of 1972, and watching those B–52s come in and just pound Hanoi. And he told us about watching one of them explode in midair when a surface to air missile (SAM) hit it. And I thought of that old baby and I went over and I read the insignia or the plate on the B–52 that you have here and in fact, it was damaged by anti-aircraft fire by a SAM missile in the skies over Vietnam.

What a heritage we have and what an important, just a critical aspect of national security. You have got some really great, bright members of the House here with you, people who really care about security. If you read the papers or were watching TV last night, you may realize we did not quite escape from the House of Representatives in time, we tried to get out of there before all the fistfights started. But we actually do some important work now and again.

There is nobody with more skill on this Commission and more understanding of science and technology than Curt Weldon, and he really devotes himself to this area. We are going to have a great, great hearing today.

Let me just say about General Lyles, I was playing golf with General Lyles the other day—he is not very good——

[Laughter.]

Mr. HUNTER [continuing]. And General Lyles and General Nielsen, and General Nielsen made the mistake of standing almost at right angles to General Lyles as he was teeing off, and General Lyles hit one right off the end of the club—John Boehner does this quite often——

[Laughter.]

Mr. HUNTER [continuing]. And it hit General Nielsen right in the forehead and he just dropped like a rock. And I said my God, what are we going to do, and General Lyles says, you know, I think I will move my grip over a little bit. [Laughter.]

Mr. HUNTER. Anyway, we are going to send some advice to Tiger Woods because they need to know how to win that British Open.

But let me just say, we have got men and women around the world, and especially an ongoing tough military operation in Iraq. The reason we were able to drive the tip of that armored spear right up through Iraq in record time and take all those bridges and oilfields and key points before the enemy could blow them, was because we had American air power paving the way with its great JDAMs, Joint Direct Attack Munitions, and our other precision munitions that are the evolution of a lot of the systems and the innovation and the technology that reposes here, and are the product of a lot of projects that were undertaken here and are being undertaken today.

We go up against nations that have 20, 30, 40 divisions on the ground compared to the mere 10 Army divisions that we have total in the United States of America. In fact, when we were in Iraq, we had an enemy force that had in excess of 20 divisions, lots of it armored, and yet we went in and were able to take them out very quickly, largely because of American air power. American air power is the key to freedom. And your real product here is not just aircraft and a lot of metal and a lot of systems, your real product here is freedom. We brought freedom to 100 million people plus when we brought down the Soviet Union. That was largely a function of the strength of American air power. And we just brought freedom to 25 million more people in Iraq, if they can keep it. And that is largely because of American air power.

So we are going to make sure we invest plenty in the coming years and we are going to make sure that we pay lots of attention to this great center of American air power.

So thanks for letting me be with you, Mr. Chairman, you run a great hearing. And thanks to all my colleagues who are doing really the most important work you can do in the country today, and that is ensure our security.

And thanks to our hosts. And it was a pleasure driving down Hobson Way, believe me, that was a lot of fun. And John, thank you. Mike Turner, thank you for your great leadership on the Committee.

Thank you, Mr. Chairman.

Mr. WELDON. Thank you, Duncan.

We are now gong to turn to the other members that are here. This is a very unusual hearing to get this many Members to come out to any one location. And again, that is a tribute to your delegation that really put the bite on the Members to get them out, as well as the cutting edge technology that is here that members wanted to see first hand.

We are not going to go in seniority order, which I know Mike Turner has a huge smile on his face, because as a freshman, you very rarely even get to say hello.

Mr. TURNER. Or sit next to the Chair.

Mr. WELDON. So we are going to start with Mike Turner who was the driving force behind us getting here. Mike, whatever comments you would like to make.

Mr. TURNER. Thank you, Mr. Chairman.

I want to thank Chairman Hunter and Chairman Weldon, General Lyles, General Nielsen for the opportunity to have this hearing. Your approving doing this and the efforts to organize it, certainly the Dayton community, the Dayton Development Coalition, worked diligently to make certain that this delegation was toasted appropriately, and I want to thank them also.

I want to thank all the Members that came out because they are taking time away from their families and other opportunities so that they can be here at Wright-Patterson Air Force Base and hear about the exciting things in science and technology that occur here.

The President was here July 4th and he, at that time, recognized the importance of Wright-Patterson Air Force Base and the science and technology that is here and he was really at the beginning of the kickoff of this community's celebration of the 100th anniversary of flight. We will be ending that celebration this weekend with this Congressional delegation having come and also recognizing the science and technology.

I know people are very familiar with the story of the Wright Brothers and that they came to this area to perfect and learn how to fly and that Wright-Patterson Air Force Base ever since that first flight, the first plane here that could sustain flight, all the way through Stealth, Global Hawk and the Predator, this base and this area has had an impact on that research and the science and technology.

Part of our heritage is represented here with the National Aviation Hall of Fame, the Air Force Museum, our National Park which is dedicated to the Wright Brothers, and I am certainly glad to have the Members of Congress here so that they can see some of the things that we have here, including many of them who will be attending the Dayton Air Show today, which is part of our celebration of flight.

We know that the science and technology that is here provides us with the advantage on the battlefields of tomorrow, and as we look to how we can invest in that to make certain that we remain a strong military and a free country, it is certainly an important focus for this hearing. And we all know that that is a result of the commitment of the men and women who are here and their commitment to excellence.

So I want to thank you for this opportunity.

Mr. WELDON. Thank you, Mike.

All of our hearings are bipartisan and all the members up on the podium are not members of the Armed Services Committee, but they are members of the Congress. Before I introduce our other Ohio Members, I would like to take the time to introduce our top Democrat from the Armed Services Committee, who came here from North Carolina and ask him to make a few comments on behalf of our Democrat friends who are as equally supportive of defense as we are on the Republican side.

Mike McIntyre.

Mr. MCINTYRE. Thank you so much, Mr. Chairman, and thank all of you for your hospitality.

I am especially glad, being from North Carolina, to come to birthplace of aviation——

[Laughter and applause.]

Mr. McIntyre [continuing]. Because once they learned how to do it, they would come back to North Carolina and have the first flight. But it is great being here and I am excited. I appreciate also our full Committee Chairman, of course, has already spoke, Duncan Hunter, and all of the Ohio delegation, they have really done quite a job. You should be very proud of them and what they do for you in Washington.

I know that Tim Ryan could not be here because of an illness in his family, so we want to remember him today as well.

I just think of three words when I think of Wright-Patterson and the hospitality and the things we have already learned and we are eager to hear more about today, as well as the folks from Ohio that represent you—that is integrity, ingenuity and imagination.

First of all, your delegation has the type of integrity that sets an example for all of us. You have heard about several of the individuals already and I just know from personal experience, not only in getting to know Mike Turner, but also working with Congressmen Hobson and Boehner, of their personal integrity. And that speaks volumes, not only for who they are, but for what the values are of the folks here in Ohio.

I also am excited about the ingenuity, because Wright-Patterson is a leader. Science and technology are important issues for us as we look ahead to the future for our military. And so often when we see that one bomb is so accurate it does the job of ten, airplanes tend to disappear on the radar screen without needing many electronic jammers to be flying around them as they used to, we see the advance from one Gulf war to the next in technology and what that has done in terms of our superiority and what we are able to do to stand up for our values and ultimately to protect lives and to be able to deliver those principles of democracy to freedom-loving people worldwide. We realize that ingenuity is making a real difference in people's lives and in what democracy stands for.

And in that imagination, from the Wright brothers, who started here at the birthplace of aviation, and went to North Carolina, then came back and perfected that even more and then taught us, in fact as a nation ultimately, and then of course as the world learned about all that they did with their imagination, it gives us the excitement to think about imagination in space and propulsion and communications, in sensors and all of the technology, and then the coordination that, quite frankly for our generals and other officers from the Air Force, that other services are benefitting from your leading the way in science and technology.

Right now, the Department of Defense (DOD's) goal is for each service to spend about three percent, as a top line budget, on science and technology. The Air Force is already at two percent, the other services are learning greatly from your example and we appreciate that.

So indeed, I say thank you, thank you for your hospitality and welcome, we are excited about today. Thank you for the integrity and the ingenuity and the imagination. May God bless you and thank you very much.

Mr. Weldon. Thank you, Mike.

The way the process works in Washington is the authorization committees determine the parameters of how money will be spent and define the amount of money that will be authorized for a given program. But authorization is not actual dollars. The actual dollars that are put forth are done by the Appropriation Committee, so it is a two part process.

In Ohio, you have the best of both worlds. You have leading advocates on the authorization side of defense spending, but you have one of the most aggressive and most successful members of the Appropriations Committee, who can follow through to make sure that the funds are actually put forth. There is, in my opinion, no one who does it better than Dave Hobson. He is aggressive, he is very well respected on both sides of the aisle. He delivers, and he makes sure that in fact in his appropriation leadership position, that the actual money that is being put forth is in fact consistent with not just what the administration wants, but also it is what is best for America. It is that check and balance system that makes our country so great. And so we are very pleased to not just have him here with us as an appropriator, but also to call him our friend. And we look forward to traveling again on Hobson Highway in our own congressional districts. In fact, I am willing to rename one of my major streets in Pennsylvania Hobson Thoroughfare if the appropriate dollars are appropriated by——

[Laughter.]

Mr. HOBSON. Thank you, Mr. Chairman—Curt. It is nice to be with all of you today, and thank you for allowing a mere appropriator to be with you today.

We do have a bipartisan approach frankly in most of our things that we do, especially on the Appropriations Committee and on this committee, which has always had a great tradition of that. And I thank you, Mr. Chairman Duncan Hunter also for being here. Curt, we will make sure we fund your projects as we go through.

Mr. WELDON. Did you get that down?

Mr. HOBSON. I am not the Energy and Water Chairman, and everybody here has got a water project—everybody in the world has a water project.

I put a couple of things in your packet, one is a fact sheet about the base that is off their website. Boehner just pointed out to me there is one little typo in here, so we need to check that out. I also gave you some golf balls, Boehner said he did not need any, he has lost all his already, and I gave him my coin, that is the new one from Energy and Water.

This is a wonderful base, but we would not be here—and I want to say this—and I want to say this—we would not be here if it was not for Mike and what a great job Mike has done on his committee, knowing these gentlemen, them tutoring him into the process, but also his bringing his expertise and his knowledge to the committee, and I think he has been very—the Chairman came up to me one day and said by gosh, that Turner, I am glad he is on our committee, he stood up and spoke out on some things that needed to be talked about. And I think that is a great tribute to the citizens of this community, that they saw in him when they voted for him to get into this job, so I want to—and we would not be here if he had not started to promote this thing.

Just a couple of things I would like to say about technology and mainly about the base. We do try to support this great technology—I call it machine that is here, they will call it the labs, but it does produce things here and they are real things and I hope the Members will get out today and go to the booths and see what is there. It is a wonderful area and we have a great heritage here.

But there are other things on this base that you should also know about. Everybody was asking me yesterday how big is it. Well, there are a lot of places a lot bigger, but it is big, it is about 8300 acres. There are about 117 other tenants on the base—and sometimes we forget about those tenants, but they are very important to our war fighting capability and to the support of the Air Force. There is the 445th here, which will be transitioning to C–5s very shortly. We have a great hospital, it is a regional medical center for the Air Force here. We have Air Force Institute of Technology (AFIT)—and when you were on that street up there, one of the reasons I think that street is that way is that AFIT was dead at one point and Kenny Craft, my staffer—I said how do we save it and he said we will just do a little study until that particular Air Force Secretary is gone——

[Laughter.]

Mr. HOBSON [continuing]. And we did it and the next Air Force Secretary kept it alive, and frankly, this current Secretary, who I had some doubts about before, because he is from the Naval Post-Graduate School, actually came to Wright-Patterson, saw the facilities and has frankly enhanced it to where we will have about 2500 young people there. We also have National Air and Space Intelligence Center (NAIC), which I think is one of the premier organizations in the world in what it does.

The other thing that we need as you go around the base and look around, we have done Military Construction (MILCON) here, we have the new Vince Russo gate out there, if you have not seen it, but we have a lot of facilities here that we have to keep up and maintain. And MILCON has been, I think, a shortened bill that frankly I am embarrassed about this year, it is so small. And I think we should all look at the MILCON because we cannot do these missions—we can fund the money for all the technology stuff that we have to do, but if we do not have the facilities to do that in, and if we do not take care of the quality of life for our people—and one thing I had hoped you would be able to see but you probably will not, as I drove in this morning, I drove by our new privatization of housing project that we have over here in some old World War II housing, which is being redone in a totally new concept, to provide the quality of life that I believe and every member here does, that our servicemen and women need.

We are very proud of this base, we are very proud that all of you came out here to view it today. I am sorry you will not have time to play golf on the golf course, as you were talking about yesterday, but those are non-appropriated funds——

[Laughter.]

Mr. HOBSON [continuing]. But we are very proud of this facility. We hope that you go away from the region seeing the great support, community support, there is for this base and the men and women who work here. A lot of people come back and—believe it or not, a lot of people come back and retire from the Air Force and other services to the Miami Valley because of the great experience they have had on this facility and the great treatment they have had from the community.

So we thank you again, Curt and Mr. Chairman, for coming out, and all you Members because I know you have all got a lot of things to do, and to take your time like this is a great tribute to Mike and to the Air Force, and you are going to hear from two great gentlemen today.

Mr. WELDON. Thank you, Dave. You can see why Congressional hearings take so long, because every Member wants to make very valuable——

Mr. HOBSON. There goes your project. [Laughter.]

Mr. WELDON [continuing]. Every Member with the exception of the Appropriations Committee, takes too much time, but we want to give each Member a chance to say a few words. The two Generals are smiling, because the more we talk, the less they have to.

But we have two full Committee Chairs here. Besides Duncan, we have John Boehner and John came along to make sure that our education was appropriate and that we do not misspeak, because he is the Chairman of the Education and Labor Committee, besides being a strong advocate for this region.

So the distinguished gentleman from Ohio, John Boehner.

Mr. BOEHNER. Mr. Chairman, thank you and I will be very brief, because on my Committee the opening statements are limited to the Chairman and ranking Member of the Committee, and other Members just get to submit written statements.

But let me just say to all of you, welcome to this field hearing, and to my colleagues, welcome to the Miami Valley. And let me just say on behalf of all of us, how appreciative we are that Duncan Hunter came, and Curt and all the Members.

Let me also give my congratulations to Mike Turner. Without his perseverance, we would not be here today. He has done a great job as a new Member of Congress and a new Member of the Committee and is the reason why this hearing happened.

And to General Lyles and General Nielsen, thank you for your service and thank you for all of your help.

I would just mention one point, mostly to my colleagues, which you have probably seen already, but I do not want it lost on anyone. One of the real great assets for Wright Patt and Dayton are the tremendous cooperation that exists between the base, the civilian population, civilians in the area, the private sector, and the Dayton business community. There is a synergy here and a cooperation that you find in very few places. And it is this cooperation and this unity of purpose that I think helps make the Miami Valley the success that it has.

And I just want to say to the commanders, General Reynolds is here, and General Lyles and others with Wright Patt, and those in the business community, we in the community owe all of you a great big thank you for your willingness to work hand-in-glove together.

With that, Mr. Chairman, I will yield back.

Mr. WELDON. Thank you. I would like to turn to our other distinguished Democrat Member that is here, another strong supporter of our nation's military, from the great State of Tennessee, Jim Cooper.

Mr. COOPER. Thank you, Mr. Chairman. In the hopes of ingratiating myself with the powerful leaders here, I have no opening statement. [Laughter.]

Mr. WELDON. Thank you, Jim. He will get no streets named after him.

Mr. HOBSON. He got his project already.

Mr. WELDON. Oh, he got his project already.

From the great State of Georgia, one of our new freshmen Members, a dynamic member of the Committee, Phil Gingrey, Dr. Gingrey, one of our medical doctors in the Congress.

Dr. GINGREY. Thank you, Mr. Chairman. And since Jim Cooper just took my speech, I will go ahead and make a few opening remarks. [Laughter.]

Dr. GINGREY. First of all, I want to thank my colleague, Mike Turner and his lovely wife Laurie, for facilitating this and being our host and want to thank General Lyles, General Nielsen and the community. My colleague, Chairman Boehner, just mentioned that and it is so important for the military and the community to work together to do things like this. I represent a district in Georgia and we have a similar situation down in the Columbus area with Fort Benning, the home of the infantry. And then from the perspective of the Air Force, of course, in my home county of Cobb and Marietta, the Lockheed Martin facility in conjunction with Dobbins Air Reserve Base there, it is just a great thing to see and to work together and to be part of that effort.

Mike mentioned in his remarks that the Members that are here this morning and this weekend gave up a lot of time maybe away from family and children and grandchildren to attend this field hearing, to see the museum last night and, of course, the air show this afternoon. But I want to say on behalf of my family, they are glad I am here. [Laughter.]

Dr. GINGREY. They understand—well, that too. [Laughter.]

Dr. GINGREY. But they truly understand what we are doing here is very significant and important and, of course, I will get to see them tomorrow.

But again, I am a little bit envious of the Ohio delegation. You all know you have a great, great delegation and your leadership up and down from top to bottom, and we in Georgia have a great delegation as well, but I am envious of all these committee chairmen and appropriators and Cardinals and just very, very happy to be a Member of the Congress and to have a great freshman class. And of course I am sitting here with five of my freshmen colleagues and it is truly, truly and honor and an honor to be serving in this 108th Congress and I am so, so glad, Mike, that you invited us and we made the decision to be with you this weekend.

Thank you very much.

Mr. WELDON. Thank you, Phil.

We could not let Wright Patt dominate the entire agenda, so we had to give equal time to Tinker Air Force Base (Tinker), and we have from the great State of Oklahoma, to make sure that Tinker gets its due consideration, one of our rising stars on the Committee and in Congress, Tom Cole. Tom.

Mr. COLE. Thank you, Mr. Chairman. That actually puts in context my remarks when I thought about coming here. It is a sacrifice to come, frankly, on the weekend. But Mike had been bugging me about this quite consistently and pointed out that we were sort of in the chain of command under Wright-Patterson, and so I called General Johnson at Tinker and asked him if that was true and he said let me put it to you this way, I work for General Lyles, that means you work for Mike Turner. [Laughter.]

Mr. COLE. So I am delighted to be here. And Mr. Chairman, in my part of the country we have brought Pennsylvania, Ohio and Delaware together on occasion, we call it the War between the States. We would just as soon not repeat the experience.

I will tell you the one place we will be looking forward to competing with all of you this year, I also represent the University of Oklahoma and we think we play football pretty well as well and we are looking forward to the coming season, as I know you are here.

Finally, quite seriously, it is a great privilege for me to get to be here. Tinker Air Force Base is the largest employer, the most important facility, the place for my dad worked for 20 years after a 20-year career in the United States Air Force, and we think we do it as well there as any place in the country, but I must say after coming here and having the opportunity to see this magnificent facility and the history and the tradition, the same kind of community support that I see in my area, Mike, I can understand why you are so justly proud of what you have here going for you, and all of you in Ohio, and I will say this to end my remarks, I did have the good sense to marry an Ohio girl from Bowling Green, so this is a little bit like—even though it is a long way from Bowling Green—coming home. You have a remarkable state and remarkable tradition here. It is wonderful to be here and to enjoy some of it with you and learn more about it, and I look forward to working with Mike and the other members of the Ohio delegation to make sure that what you have here, not only continues here, but continues the tradition of excellence and the contribution that you make, frankly, to defense of freedom around the world is something that everybody on this podium takes very seriously and we appreciate it.

Mr. WELDON. Thank you, Tom. And our final speaker and member that has joined us today is another rising star on the committee and in Congress, and we saved the best for last because we want you to know he is an intelligence expert. He hit the ground running when he came to Congress. In fact, he spent last night getting a briefing from the outstanding intelligence asset capabilities we have here. He takes his job very seriously and if he does not like this hearing, he can always go back to the guy that has the job that he used to have. You see, he used to carry the black box that controls the nuclear codes for the President. So if you do not pay attention to this guy, he can do the ultimate, he can nuke this entire facility. [Laughter.]

Mr. WELDON. From the great State of Minnesota, John Kline.

Mr. KLINE. Thank you, Mr. Chairman. I cannot tell you how thrilled I am to have the opportunity to say hello, as a freshman Member, so I thank you very much for that.

I want to thank Mike Turner for pushing us, his fellow members of the freshman class and the other distinguished Members of Congress who are here, to come to this hearing.

I am very anxious to hear from the General, so I will be very brief and say that I thought it was remarkable last night as I was sitting in this museum, in the hangar, and looking at the aircraft developed over the ages, and listening to the names of the real aviation heroes that were in that room. And I think it is a very good thing that you have this heritage and this museum co-located with the effort to move forward in cutting edge science and technology and research and development, because it reminded me, and I hope all of us, that those heroes are heroes because they pushed through some very, very tough times. They did not allow some setback and sometimes tragedies that occurred over the years, over the decades, as new leaps in technology were reached—they did not allow those setbacks to stop them. They pressed on, and I hope that we will follow on in their steps as we look forward to new cutting edge technology in fixed wing and rotary wing technology, that we are not stopped either, and move forward to have, 50 years from now, a museum with some more marvelous pieces of technology and some more heroes behind them.

So I am excited to be here, I am looking forward to hearing from the Generals and you all should be very proud of this base and all the folks on it. It is a terrific place.

Thank you, Mr. Chairman.

Mr. WELDON. Thank you, John.

And now we turn to the real purpose of the hearing, after we have all had our chance to make our statements and our jokes and have some fun—the real purpose is to listen to the guys who really provide the service for America that make our nation's military the best that has ever existed on the face of the earth. And we have two examples of that sitting in front of us.

They do not, oftentimes enough get a pat on the back because they take their job seriously and they do it because they have committed their lives to protecting America, very selfless service where they unselfishly take time away from their family, but in the end, they perform those duties assigned to them by the Commander in Chief. And you have two of the best right here and we are pleased to now turn the hearing over to General Lyles and General Nielsen.

As you know, your joint statement, without objection, will be entered into the Congressional Record of the hearing. And General Lyles, it is an honor to offer you the floor to make whatever comments you would like to make.

## STATEMENT OF GEN. LESTER L. LYLES, COMMANDER, AIR FORCE MATERIEL COMMAND

General LYLES. Mr. Chairman, thank you very much. We welcome you here to Wright-Patterson Air Force Base and Dayton, Ohio. You know, we have used that term, this is the birthplace or the home and the future of aerospace, and I think we sometimes take that for granted. It is really a significant historical fact and one that we are all very proud of here at the base, and certainly here in the community.

And if I changed the word aerospace to military aviation, that term takes on even more significance, particularly in light of the contingencies we have had in this country and the world over the last 10 to 12 years. Air power has become more and more dominant and more and more important for winning all of our wars and certainly for the United States Air Force. Every aspect of air power, whether you are talking airplanes and the things that support them or space system, are all the responsibility of Air Force Materiel Command, and we are very, very proud of that and proud of our heritage from the Wright Brothers and their legacy, and certainly proud of all the things that take place in this wonderful Command.

General Nielsen and I are very, very honored and appreciate the opportunity to provide our testimony. As we stated, Mr. Chairman, I am going to keep my oral remarks very brief and we have submitted the formal remarks for the record, and I look forward to your questions.

Just want to make a couple of brief comments. One, to reiterate what Congressman Hobson said, Wright-Patterson Air Force Base is a very, very unique place and unique organization. We are blessed to have a lot of great capabilities here and a lot of organizations here. This is the home of—the headquarters of Air Force Materiel Command, my headquarters for the entire Command. The Command itself is remarkable, every time I think about it. We have ten major bases around the country, in the States of California and Florida and Oklahoma and Georgia and Texas and Utah and Massachusetts, Tennessee—all great places, 82,000 people. And we are responsible for any given year to execute about $42 billion of the United States Air Force money that you appropriate—authorize and appropriate to us, to get our mission accomplished.

But here at Wright-Patterson Air Force Base, we are very unique. Besides providing management and oversight for all of those 82,000 people and all the things that they do, we also have the responsibilities of executing some of those programs and missions also. We are blessed to have the Aeronautical Systems Center here led by Lieutenant General Dick Reynolds, who is here in the audience. They are the ones who are responsible for all the aeronautical systems from B–2 to B–1s to B–52 changes and improvements, F–15s, joint strike fighter for the future, FA–22 for the future, unmanned vehicles like Predator and Global Hawk, all of them owe their support, leadership and management here to Wright-Patterson Air Force Base.

Our hearing today is going to focus on Air Force research and development, science and technology and our Air Force Research Laboratory is headquartered here, managed by my colleague to my left, Major General Paul Nielsen.

We in the Air Force several years ago established a single Air Force research lab. Paul runs that from here. There are several directorates in that laboratory and Paul will show you where they are, but most of those directorates are here and reside here at Wright-Patterson Air Force Base.

He will get into and will talk about and you will get a chance to see some of the cutting edge technologies that we either have today or we are building for the future. And we are very proud of that.

Congressman Hobson also mentioned another very important element of Wright-Patterson Air Force Base. It is not part of my Command, but if you will, it is the seed corn, if you will for everything we do—the Air Force Institute of Technology, led now by Brigadier General Select Dave Eidsaune, who is also here in the audience. AFIT provides us with the resources, the key resource, to get the jobs done—the scientists, the technicians, the management expertise to make sure we can do everything we are charged to do within the United States Air Force.

You also mentioned our intelligence features here. The National Air and Space Intelligence Center, NAASIC, which I think Congressman Kline had an opportunity to visit yesterday, is also headquartered here at Wright-Patterson Air Force Base. They are not part of my Command, but they are an integral part of everything we do in our United States Air Force.

So this is a very, very unique organization, unique place, and as stated by several of you, we are also blessed to have tremendous community support.

I dare say if I go back and look at last year, the Air Force Times magazine, which is one of the periodicals that comes out once a week, had a vote to determine what was the best Air Force Base in the country—actually in the world—and the base that was voted the best, I can say to Congressman Cole, was Tinker Air Force Base. And when you went back and peeled the statistics to find why Tinker was named, it said and the people said that it was named to that distinction because of the great community support.

And I had to go back and look at all of our other bases, but particularly Wright-Patterson Air Force Base. I think that distinction could have been given to every Air Force Base and Air Force Materiel Command, but particularly Wright-Patterson. We have unique tremendous community support here. So we are very proud of what we have here.

Let me just cut to the chase very quickly and talk about science and technology. Congressman Weldon, you mentioned it in your comments, we, in spite of some challenges to our budgets overall in the United States Air Force, we have managed to increase the science and technology budget in our President's budget submission for fiscal year 2004, it is now up to $2.2 billion. That is an increase of $535 million from fiscal year 2003 President's budget.

There are a lot of things that are now our responsibility and charge of for the United States Air Force that have caused parts of that increase—high performance computer modernization, a very strong concern I know of Congressman Hobson, is now the responsibility of the Air Force for the entire Department of Defense. University research initiative, a very strong concern of all of you I know, is also now the responsibility of the Air Force for the entire Department of Defense. And then that I am very, very fond of, high energy laser work. We are responsible for that for all of the Department of Defense. There is also an additional $150 million provided to us for the national aerospace initiative, to develop cutting edge hypersonic and other technologies we will need for access to space and other realms is also given charge to us in the United States

Air Force. And we have all of those as part of our budget for fiscal year 2004.

So we are very proud of the opportunity to take these technologies, take these technology areas and to be very, very successful in making sure that they are accomplished in the right way.

Mr. Chairman, we have three major strategies and principles for science and technology. I would like to expand on each one of them, but in the interest of time, let me just mention them and give one brief comment.

One is pursuing integrated, innovative technology solutions to make sure we are supporting our war fighters' needs in every aspect. You have no better example of that than what is developed here at the Aeronautical Systems Center and things like the Predator and Global Hawk. You saw them, those who were at the National Air and Space Museum dinner last night, you saw a Global Hawk and a Predator with Hellfire missile hanging from the ceiling. We are very proud of those two systems. They are examples of cutting edge innovative technologies that in some cases are still in development, but we are using them now to support our national security needs.

The second strategy and principle is pursuing fundamental new and enabling technologies. There is no better example of that cutting edge technology than what Paul Nielsen will talk about that we are doing in our Air Force Research Laboratories.

And the third is one that is very important to all of us and I think is really the most important thing, to me and others, and that is to attract and nurture outstanding scientists and engineers. There are a lot of things we have done over the last couple of years with your support, with particularly the strong support of the Ohio delegation to make sure that we are protecting that most valuable resource—the scientists, technicians and engineers we need for today and we certainly need for tomorrow's United States Air Force.

Again, I would like to expand upon each one of those, but I will save perhaps the opportunity in the question and answer session to address each one of those in perhaps a little bit more detail.

Let me just close very quickly in conclusion to tell you, the Committee members, that we are committed in the Air Force, committed at Air Force Materiel Command and certainly committed here at Wright-Patterson Air Force Base to advance air and space technologies, to integrate them, to make sure that they are cutting edge and to get them into the field to support our war fighters. We are an integral part of the Department of Defense science and technology team and indeed, I think we are leading the science and technology team. And we are very proud of the workforce we have that gets the job done on a daily basis.

Mr. Chairman, I would be remiss, since you made reference to the fact that I am going to be retiring after a little over 35 years of service to our country and the United States Air Force—I would be remiss if I did not offer my personal thanks and appreciation to you and to Congressman Hunter. As you noted, we had an opportunity to work together for a little over three years in developing the missile defense systems for our country. And I strongly appreciated your support, your personal support, Congressman Hunter's personal support, your nurturing, your leadership, but more importantly your friendship as we went through some trying times, solved some very, very important problems and got this country to where it is today in missile defense. I owe a debt of gratitude to you, Congressman Weldon, and you, Congressman Hunter. Thank you for your support, God bless you continuously and I look forward to continuing to serve in some capacity even after I am out of uniform.

Mr. WELDON. Thank you.

General LYLES. Thank you, sir, and I look forward to your questions later.

Mr. WELDON. General, we want to give you a standing ovation for your testimony.

[Standing ovation.]

General LYLES. Thank you, sir. Thank you.

Mr. WELDON. Thank you, General. General Nielsen, the floor is yours.

## STATEMENT OF MAJ. GEN. PAUL NIELSEN, COMMANDER, AIR FORCE RESEARCH LABORATORY

General NIELSEN. Boy, how do you follow that?

Well, thank you, Mr. Chairman and Subcommittee members. It is a real honor for me to be able to provide some testimony to you on something that is so important to me, the Air Force science and technology program.

All of you know, this is a real special year for aeronautical technology, for the U.S. Air Force and for the Dayton community, this 100th year of the anniversary of powered flight by the Wright Brothers.

This committee and its dedicated staff, have supported, bolstered and enhanced the Air Force science and technology programs throughout the three years of my tenure as the Commander of the Air Force Research Lab (AFRL), and I know from my good friend, my predecessor, General Dick Paul, that you did this also through much of the 1990s. Today's airmen and tomorrow's are really indebted to this Committee for the great support that they have provided.

Now this hearing has a special emphasis on aeronautical science and technology, and the heart of that work is clearly here at Wright-Patterson and with an ancestry that goes back to the Wright Brothers, the Huffman Prairie, the birth of the laboratory system that has grown into the Air Force Research Laboratory; but it is important to recognize that the Air Force Research Lab is more than aeronautical science and more than Wright-Patterson.

So I put up a slide here to show you the various locations of the Air Force Research Lab. We have got ten major sites in the continental United States—in Massachusetts, New York, Virginia, Florida, Ohio, Texas, New Mexico, Arizona and California. In addition, we have some special facilities, some very unique facilities, in Hawaii and Alaska, as well as small offices in Tokyo and London.

In addition to aeronautical research, we work on space and information technologies, munitions, materiels, directed energy. We span the Air Force's total work in basic science, applied research and advanced technology demonstrations.

The second point I would like to make while we are here is that we are not predominantly an in-house laboratory. Each year, about 80 percent of the funding that comes to the Air Force Research Lab goes to industry and academic institutions. We work hard to reach out to the best and brightest of our country, wherever they may be. And in this way, we ultimately have a workforce throughout the country—big companies and small businesses, academic institutions and sometimes even smart individuals, innovative individuals. And therefore, we provide economic and intellectual impact throughout the country.

Today, I would like to take a few moments to highlight several of our recent transition successes during the war on terror. I have listed several of them up here, I am not going to talk about all of them in the interest of time. One of the most important ones that we feel very personally is the second one up there, the battlefield air operations kit.

In the Air Force, our Special Tactics Combat Controllers are sometimes the first people into a country, they are the people that have really worked hard in Afghanistan, behind the lines, inside the country in Iraq. And often, we have found that we send these people in with backpacks weighing 150 pounds, operating sometimes in Afghanistan at 10,000 feet or more. We have worked hard over these last few months and have made some really quick progress on lightening their load, on combining some of their equipment, on letting them have a little more room in their backpack for some food and water instead of just the equipment that they carry in to do their job so well. This special partnership we have with the Air Force Special Operations Command and the U.S. Special Operations Command has really come into a great fruition right now. We are working on some things in the future to help provide them with real digital machine-to-machine capabilities to do their job even better than they have in the past.

In addition, I will highlight a couple of others on there, the laboratory transition to advanced munitions during the few months right before Operation Iraqi Freedom that were extremely important. One up there called crash PAD, the crash prompt agent defeat munition, is designed to neutralize chemical weapons that might be found with intense heat. And the surface target ordnance package, which has now been renamed the passive attack weapon, the PAW. It is a non-explosive weapon designed to penetrate soft storage facilities while producing an environment that will mitigate the spread of biological or chemical weapons and their agents. Both programs have proven to be a significant resource for the war fighter and were deployed into Operation Iraqi Freedom.

Working closely with operational users, the Air Force researchers here at Wright Patt continue to develop and transition new technologies that provide improved eye protection to air crews from varied levels of laser threats. The laser eye protection program enables air crews to conduct day and night operations without visual jamming or personal injury.

Other work here in Dayton that is extremely important has been in the integrated panoramic night vision goggles, which give people a much more natural view of their surroundings as they go into night time operations—real important to our air operators as well as Army tank crews, et cetera.

I want to mention one thing at the very bottom here—sorry, it is not at the bottom, but it is another issue that came up that is real important. We have developed something that is important both for civilian and military first response providers, in what we call the first response expeditionary fire vehicle. This is a small and lightweight fire vehicle that can be brought to the theatre faster than you can get the big fire vehicles and yet has all the capability and capacity of the large vehicle. It is not going to have the sustainment of a big vehicle, but it can put out some fires real quick. And General Lyles and I both have been able to experiment with that down at Tyndall Air Force Base, where this work is ongoing.

The Air Force science and technology provides a means for conducting world class research that enables new technologies and capabilities to be developed and used by war fighters in order to maintain the technological superiority that we need as we go to war. The aim of the Air Force Research Lab obviously then is to identify those areas of science that, through exploratory research and advanced development, may yield breakthrough technology for the Air Force.

The five areas highlighted on the left of this screen are the areas that we see the most potential right now. You know, the information revolution has been ongoing for many decades, but it still has some horsepower, it is still advancing. We are still finding ways to double and redouble and redouble computational power, processing throughput memory, and this enables us to do so many things.

Many of you may have heard of biotechnology and think of that often in the guise of medical research, environmental research, agricultural research. We are not trying to duplicate that in the Air Force Research Lab, but there is a niche of biotechnology that is extremely important to the military, and that is what is called sometimes biomimetics. How do you imitate nature? In many cases, nature has solved some problems that the military is still trying to solve. How do you detect heat? We have our infrared detectors that do that. Pit vipers can do this, many insects can do this from far away. So we are trying to understand and study how nature has solved some complex problems to see if that can help us.

In other areas of biomimetics, we are looking at self-repair, self-assembly, things like that, to see how that could help us. In the area of self-repair, of course, all of us, if we cut ourselves, even starfish if they lose a whole limb, can regrow that limb. In our structural materials, if we have a small cracks that tends to grow and propagate until ultimately we have a structural failure. It would be great if we could find some way to have materials heal themselves. And at the basic research level, we have already found that, we have done some plastics now that can heal themselves when they start to have cracks. We want to continue that kind of work into the future.

You know that we have put a lot of work into nanotechnology. I do not think I need to speak about that at great length right now.

In addition, we are swinging much of our resources into the space community right now. Four years ago, my predecessor noted that we had about 11 percent of our technology money related to space technology and he set about to double that. Right now, we have about 23 percent of our overall science and technology program dedicated to space technologies.

And then the final area up there, directed energy. This is an area that is about to explode upon the U.S. military. In much the same way that the stealth technology changed warfare in the last 1970s and 1980s, and precision guided munitions and Global Positioning System (GPS) changed things in the 1990s, I am convinced that directed energy technology is going to change the way we fight wars in the 21st century. And this is not just as weapons, although clearly the airborne laser and other weapons are going to be important. It is also lasers as communication media, also lasers as sensors. We see lasers and also high power microwaves as technology that is about to burst on the scene and really change the way we fight wars.

We have two big initiatives that are present in the fiscal year 2004 budget that has been submitted to you, and I will take a second to talk about each of them.

First, working with the entire space community, we are increasing our science and technology investments in space communications to support the ultimate development of what is called transformational communication system. I think you have heard of that, you know that there is a program office in Los Angeles that is combined with other agencies of the government to look at providing the great big backbone in space for laser communications. In addition though, in the Air Force Research Lab, we have reprioritized about $450 million of work to support that with the science and technology base. And in particular, we are looking at the extra dimension of once you get these big pipes in space, how do you get that information down to the soldier on the field or the airman in the airplane. We will be able to do some of that still at laser frequencies and some of it we will have to cross band down to Radio Frequency (RF) frequencies, and that is what we are working on in this great initiative of transformational communications.

The second initiative—and General Lyles has alluded to that a little bit already—under the leadership of Director of Defense Research and Engineering (DDR&E), we have committed to a national aerospace initiative, an initiative important not only to the Department of Defense, but also to continued American aerospace leadership. The goal of NAI is to develop technologies that will allow us responsive, reusable and affordable access to space.

There are three key pillars to the NAI program that we are working with DDR&E—high speed hypersonics, access to space and then continued advances in space technology. And we seek your strong support for this important initiative in this 100th year of powered flight.

Now like any great organization, we recognize that our most important asset, the one we can absolutely not do without, is our people. We have a superb group of world class scientists and engineers in our laboratory, both men and women, both civilians and military. We need to do all that we can to continue to attract our nation's brightest men and women to this service and to motivate them to continue to develop themselves and contribute to our nation's defense.

The Air Force Lab was the first laboratory in the Department of Defense to take advantage of legislation allowing us to experiment with alternative personnel management systems for our civilian scientists and engineers. This laboratory demonstration project, or what we call lab demo, has successfully combined a simplified job classification system, broad pay band levels and contribution-based compensation to enable AFRL to compete with private industry for some of the top science and engineering talent in our country. This contribution-based compensation system has provided our managers with the ability to manage their workforce and properly compensate high contributors. For instance, we have provided salary increases to some young, but extremely impressive young scientists, of over 30 percent a year to continue to keep them in the government and to show them how much we appreciate their contributions.

On the other hand, this allows us, at times, to give a clear signal to people who are not performing and either have them change their performance, to increase their performance, or to leave government service, and we have had people do that as well.

This year, as you know, the Department of Defense is proposing a new personnel system for the whole department that incorporates the best features from the various personnel demonstration projects that have been around the department. We are working with OSD, with all the people in OSD, to make sure that this system will retain the key flexibilities that have been so useful to us and that are so important to attracting science and engineering talent.

In the meantime, of course, we are finding, mentoring and recruiting the future generations of scientists. You all know that our workforce is aging somewhat, but in science and technology, we find people that work well into their later years and they are great productive members. So what we are trying to do is bring on our new folks, the new people we can attract from the universities and colleges around our country, at a time when they can be mentored by the great experience of wise owls that we have. As my hair turns gray and falls out, I am beginning to appreciate wise owls even more all the time here. [Laughter.]

General NIELSEN. We have a robust recruiting program that is going to campuses, conventions and job fairs, trying to recruit bright, motivated, enthusiastic, and a diverse crop of scientists and engineers. We are also reaching out to colleges, high schools and even elementary schools with numerous summer programs, work/study programs and educational outreach initiatives. I will mention two.

Here at Wright Patt, the Wright Scholar Research Assistant Program hires promising high school students in their junior and senior years of high school to work with volunteer mentors on real research projects during the summer breaks for the students. This could lead into ultimate hire as a civil servant later on in their careers.

At our Phillips Research Site in Albuquerque, we are combining math, science, engineering, communications and the arts into a unique experiential learning opportunity designed for fifth graders, even at the fifth grade level. And this goes throughout the State of New Mexico.

Clearly, our scientists and engineers and the staff members who support this work are the finest our nation has to offer and we all owe them a great debt of gratitude.

As the foundation for evolutionary war fighting, AFRL has also recognized the need to transform our business processes and the way we work with our customers. You know that this is a big initiative throughout the Department of Defense. We have several initiatives that we have undertaken already that we are extremely proud of. I will just mention them by title, I think they are referenced in our written testimony—our Applied Technology Councils have really increased our connection to our war fighter and improved the transition of our technology into actual programs. We are now embarking on a whole thrust for capability-based planning. This actually leads off of the Congressionally mandated S&T planning review from 2001. We have taken advantage of the work that we did on that and have institutionalized that into our processes. So we feel that we have got some great initiatives on here.

In conclusion, I would like to emphasize that 100 years of aeronautical research have taken us from Kitty Hawk and the Huffman Prairie to Tranquility Base and to extensive use of space. These 100 years have taken us from the Wright Flyer to the establishment of this great aerospace industry in our country and a commercial airline industry that has really shrunk the world and changed the quality of all of our lives. These 100 years have taken us from the World War I fighters that you have in this museum to the FA–22, the B–2, the C–17 and to Global Hawk, Predator and UCAV. While we celebrate the first 100 years of flight, we must stand in awe at how aeronautical technology has accelerated and changed all of our lives. We should relish this past, but we need to recognize that our responsibility is to the future, to our children, to our grandchildren and to the next 100 years of flight.

With your strong support, the Air Force Research Lab and the Air Force science and technology community is creating this future for our Air Force and for our nation.

Thank you very much, Mr. Chairman.

[The joint prepared statement of General Lyles and General Nielsen can be found in the Appendix on page 38.]

Mr. WELDON. Thank you very much, General; thank you both for your testimony and for your leadership.

I think one of the things that people in America—by the way, Chairman Hunter had to go back to Washington, so we excused him while you were speaking and he extended his regrets for having to leave, but he has some pressing business to take care of in support of our troops deployed right now overseas.

One of the things that the American public needs to more fully understand, and I think in areas like Wright Patt, they do; is that all the major technology advances that have occurred in the U.S. over the past 100 years have largely come from the investment in R&D and science and technology dollars for the military. From laser technology to technology associated with the internet, it has all come from the military and much of what you are doing is driving that technology envelope so that we in fact can provide the benefit not just for our military, which is our primary purpose, but so that the civilian community can benefit directly. And I think perhaps you could just take a few moments and discuss some of the advances you are making in that area, but I want to just say that I also appreciate the fact in your statement that you said that you are relying on the private sector. It is the government overseeing it through the military, but a lot of what you are doing is done with private sector contractors.

General NIELSEN. Yes, sir.

Mr. WELDON. So that where we can have individuals and entrepreneurs create research and cutting edge technology, they become partners of yours, whether it is through an academic institution or through a research organization. You gave an example that hit me very well as you know, and that is your work in fire protection research. Having been a fire chief before coming here and working all of the issues with the fire service in the country as a part of homeland security, including Ohio, you are doing cutting edge work there as well.

So you might want to just comment for a moment or two on some of the—just for the public—some of the benefit to come about because of research being done by not just the Air Force Research Lab, but by the military R&D budget. And I will just ask maybe each of you to just name a few of the kinds of things that you could identify off the top of your head.

General LYLES. Well, let me just start, Mr. Chairman, with one that I think we all take for granted nowadays, and that is GPS technology, global positioning system navigational technologies, which literally has changed the way we do everything, from the Navigation (NAV) systems in cars to precise navigation in airplanes, commercial airlines, private airlines, boats, you name it, hand-held devices. That was all military technology of about 20-25 years ago that now has literally changed the way the entire world operates. And I dare say there is a part of GPS that most people are not aware of, all the banking industry depends on timing for shipping money from one place to another, one bank to another, one part of the world to another on the GPS signals that come from those satellites. So it has revolutionalized everything that goes on.

There are many, many others that we are going to see in the future.

Laser technologies that we use for military applications are already beginning to change the way we do medical research, medical operations, and they certainly are going to change the way we can even do security operations. One of the things you will see in a demo upstairs is something we call an application of high powered microwave. The device you will see upstairs is a miniature thing, we call it a finger zapper and what it represents is directed energy, high powered millimeter wave technology that allows you to control a crowd in a non-lethal way to literally be able to combat situations like we are seeing in Iraq, like we are seeing in Afghanistan. I can just imagine what any police force would do as soon as we mature this technology in the next couple of years. It will change the way they operate and do a lot of different things.

Those are two examples, one current, one in the future. There are many, many others. And, Paul, you can add to that.

General NIELSEN. I would like to add one special one that sometimes people forget. About three years ago, Jack Kilby of Texas Instruments received the Nobel Prize for his part in the invention of the integrated circuit. We were sponsors of Jack Kilby's work in the 1950s and early 1960s and he wrote us a great letter after he got the Nobel Prize saying that without the support from the United States Air Force, he would not have been able to persevere, even within his company, to develop the integrated circuit. We all know what the integrated circuit has meant since its invention in about 1959 and how it has changed our whole economy, the whole world economy.

So that's another great example to go with General Lyles' examples.

Mr. WELDON. Those are both outstanding examples, all three of them. It is important for us to constantly underscore to the American people that a good part of our defense budget is not just going into guns and missiles and offensive programs that harm people but rather new technology that can provide security for people in America and around the world and allow us to have breakthroughs in everything from health care, to nanotechnology, to better ways to develop material sciences, composites and so forth. So when we invest in our military R&D budget, it pays tremendous dividends, plus, as you all know, in the 61, 62 account lines, a lot of that money goes for basic research at universities.

General NIELSEN. Right.

Mr. WELDON. And students that do academic research and postdoctoral research are funded with military grants. And they are not doing work on guns and weapons, they are doing work on basic science.

We lose sight of that in America, and whenever I get a chance, I try to reinforce that so that people know when they invest in our defense budget, it is going for the benefit of them eventually down the road, because of this huge R&D capability that we have and Wright-Patterson is certainly the premier of that capability.

Let me turn to my other colleagues for questions. I will turn to Mike first.

Mr. TURNER. Thank you, Mr. Chairman. It certainly is exciting to hear about the advances that you are making in the laboratories and the science and technology.

I have always been a big fan of the labs here at Wright-Patterson Air Force Base. In high school, I had the opportunity of spending a quarter where a half day of the school year, I was in the metallurgical labs here, learning what types of careers and opportunities that there were in the labs, as part of a mentoring program with the Dayton Public School System.

General Lyles, in your comments, in the written testimony that you have given to us, you talked about the Aeronautical Systems Center and its responsibility for procurement of almost every major weapon system in the Air Force inventory. In your statements here, you also talked about the team here at Wright-Patterson Air Force Base for Global Hawk and Predator's development here at Wright-Patterson Air Force Base.

As you know, the Department of Defense is in the process of deciding where to locate the acquisition work for the unmanned combat aerial vehicle, looking at its consolidation. I was wondering if you could give us some insight as to the experience here at Wright-Patterson Air Force Base and what some of the advantages might be of that being located here at Wright Patt.

General LYLES. Well, Congressman Turner, the UCAV program, unmanned combat aerial vehicle program, is already sort of a joint effort between DARPA, the Defense Advance Research Project Agency, the United States Air Force and now the United States Navy. Under the leadership, from an enterprise perspective, of Lieutenant General Dick Reynolds, and his individuals here at Aeronautical Systems Center, we have been partnering with and helping to lead what happens, how we have matured the technology, how we establish a program acquisition for UCAV.

It may seem parochial, but because of the expertise, not just the technical expertise that comes in the laboratories here at Wright-Patterson, but more importantly, the management expertise on these developing aeronautical vehicles that have to integrate with other aeronautical systems. The natural place I think this organization should reside is here within the Aeronautical Systems Center under Dick Reynolds.

We are working with the Air Force, working with the Navy, working with DARPA, to define exactly how we set up the management structure for this, but from a synergistic standpoint and where the expertise and experience lies, to me, the natural place to do that would be to have it here at Wright-Patterson.

General NIELSEN. I would like to add one thing to that, if I could. There's a special relationship here at Wright-Patterson because of having the laboratory work that goes on here in conjunction right across the street, sometimes deeply embedded with the Aeronautical Systems Center work that goes on here. It enables us to transition technology much quicker into systems and so the partnership between the Air Force Research Lab and the Aeronautical Systems Center here at Wright Patt is really a unique arrangement that is of utmost value to the Air Force.

General LYLES. We are piling on here a little bit, because this is such an important topic for the future. But there is one other element that is growing. General Jumper has been very popular and very adamant about emphasizing capabilities effects development. Not just a specific stovepipe weapons system, but developing the capability, and he has used the term that the enterprise management approach that we are using here at Air Force Materiel Command, particularly Wright-Patterson, is the way we need to develop every system.

UCAV is going to be part of an enterprise, it cannot operate alone. It has to be part of a synergistic weapons system with command and control, with sensors, with other platforms. The center of enterprise management is here under Dick Reynolds here at Aeronautical Systems Center.

So again, to me, it just makes sense to have the management of that program at this location.

Mr. TURNER. Thank you.

Mr. WELDON. Mr. McIntyre.

Mr. McIntyre. You mentioned about people being the key and the fuel and source of your ingenuity and all that y'all have done. Is there anything that we can do, that we can take back with us in Washington, to assist you in increasing the supply of aerospace engineers or even perhaps those interested in chemistry, mathematics, physics, other areas that would help fuel the supply for the future?

General Lyles. Well, Congressman McIntyre, from my perspective, one of the key things obviously is what you and others in Congress are already doing and that is emphasizing the importance of science, technology and math in our schools for all of our people. Our country, to some extent, is not as far along as we should be, compared to some other countries in the world in emphasis on math and science in our young people, and we need that seed corn, if you will, starting at early ages, in order to grow the scientists and technicians and engineers that we will need for the future—not just for the military, just for our own economy.

And the programs that Congress has already approved to help us in terms of accessions, growing intern programs, operating scholarships and bonuses to not only retain the engineers and scientists that we have today, but recruit even more, are very, very important to us and we just want to urge that you continue that great support because it is going to be really important to us in the future.

Mr. McIntyre. Thank you.

Mr. Weldon. Thank you, Mr. McIntyre.

Normally in a congressional hearing, we would go down the line and ask all the members who would have questions lined up, but because of our time constraints, I appreciate the Members cooperating with us.

General Lyles and General Nielsen are going to host us in a tour of technology upstairs, and we will not ask additional questions. But we will allow for members to submit formal questions for the record. Everything that has been said is taken down, that becomes a permanent record of this process, which is a part of the ongoing deliberations that occur in Washington. One of the pluses of our system is all of our hearings are open and in the public, you can get copies of the proceedings of any of any of our hearings by contacting your Member of Congress. It becomes a permanent record of what was discussed and the points that were made, as well as follow up questions that we submit for the record, which they then in turn answer for the record. So it becomes a good way for this communication process between the Executive Branch and the Legislative Branch to interact on giving you the best value for your tax dollar.

So I want to thank you both. I want to thank all of my colleagues for being here today and as was mentioned, they could have been a thousand other places today, but they chose to come here because of the diligence and persistence of your Ohio delegation, and in particular, Mike, who is just a fantastic leader.

We also want to thank the staff. Everything we do in Washington depends on good staff. We have committee staff that organized this hearing, as they do all of our hearings. If I could have all the committee staff on the Armed Services Committee please rise, so we can acknowledge and thank you for your leadership. Up here and I think there are a few in the audience. These are the staffers on the committee that worked the process for us.

I would now like to ask our personal staff, I would like you all to stand, who work on behalf of members, who came with us, who represent other Members that could not come here, but will go back and report to their members of Congress the information, they will report what they saw. So we develop a whole capability of interaction. These are the people who work to make the success of the leadership of people like General Lyles and General Nielsen allow us to do the good job on behalf of you the taxpayers. It is a very in-depth process, it does work. It is not perfect, but it is the most responsive system known on the face of the earth and we are proud to all share our proper role in that process.

Thank you, staff for the great job that you have done in organizing this. And Generals, again, we cannot thank you enough. We look forward to going through and seeing the exhibits and look forward to seeing the air show later on today.

And for the people of Ohio, thank you for your great contribution, not just for this state but for the future of America and the security of our country.

This hearing now stands adjourned.

[Whereupon, at 9:54 a.m., the subcommittee was adjourned.]

# APPENDIX

July 19, 2003

# PREPARED STATEMENTS SUBMITTED FOR THE RECORD

JULY 19, 2003

Statement of the Honorable Curt Weldon
Chairman, Subcommittee on Tactical Air and Land Forces

Air Force Science and Technology Programs
Wright Patterson Air Force Base, Ohio

July 19, 2003

The Subcommittee will come to order.

We are very pleased to be here in Dayton today to join in the centennial of flight celebration by highlighting your rich aviation heritage and the importance of science and technology programs to the future of the Air Force and to our nation's security and economy.

The science and technology community here at "Wright Patt" has made major contributions in providing the superior advanced capabilities that exist in today's Air Force that make our military as a whole without equal in the world today. You deserve credit and should take a great deal of pride in the world class technology that gives our Air Force the premier systems it has. The advanced technology demonstrations developed and managed from here directly contribute to several critical enabling capabilities such as the Global Hawk and Predator UAV's, with their advanced sensor systems; the "Litening" navigation and laser targeting pod; and the communications networks that link all of these systems together.

Achieving an adequate commitment of resources to fund science and technology programs that provide these kinds of superior capabilities is a perennial Washington battle, both in the Pentagon and on Capitol Hill. The pressure is always on to fund near term needs and put off the more abstract and less immediate, longer term needs. This is certainly the case today, with our troops deployed around the world in the battle against international terrorism. Because the near term is much more tangible, convincing decision makers to increase the commitment to critical, yet less defined science and technology programs is always an uphill battle. This requires everyone in the science and technology community to ensure that redundancies among the services be reduced to the maximum extent possible and that resources are applied to technologies that offer the greatest promise to providing future war fighting capabilities. This is a difficult challenge, if nothing else, due to the nature of the scientific process and the complexity of the technologies involved.

The science and technology community needs to work through its professional associations, academic institutions, and other organizations to ensure that your legislative representatives realize the importance of what you do and what your contribution has been and continues to be. In 2003 as in 1903, the critical element to scientific innovation and "discovery" is the self disciplined, highly motivated scientist and engineer. However, it takes more than a bicycle shop as a venue to provide the necessary tools to support technological innovation and development in the 21st Century. As you all know, providing adequate labs and facilities takes major, sustained funding. And the competition for those resources continues to be fierce. That is why we must all work harder to see that adequate resources are made available if we are to be world class providers of aerospace technology in the future.

Much of the renewed vigor in science and technology funding within the Air Force can be credited to "Team Dayton." Your local leaders as well as your past and present representatives in Washington have been aggressive supporters of the need for increased science and technology program funding. Even with the pressure on the federal budget, Air Force Science and Technology funding will be up over 10 percent this coming fiscal year. Sustained commitment is required if we are to maintain U.S. leadership in aerospace technology.

I would like to welcome today's witnesses, General Lester Lyles and Major General Paul Nielsen.

Before we begin I believe there are several Members who would like to make opening remarks. First, let me call on my friend, the Chairman of the Armed Services Committee, the gentlemen from California, Duncan Hunter, for any comments he would wish to make.

General Lyles and General Nielsen, your joint statement will, without objection, be entered into the hearing record, please proceed with your opening remarks.

General Nielsen, please proceed with your opening remarks.

**Issues/questions:**

**Concluding comments:**

General Lyles and General Nielsen, I'd like to thank you for appearing today. I'd also like to thank all of your people that have supported your testimony and putting together the technology display that we are about to visit. I an aware that a great deal of effort has gone into preparing for the hearing and the centennial celebration. We appreciate the hard work of all involved. Thank you very much for hosting our visit.

# DEPARTMENT OF THE AIR FORCE

## PRESENTATION TO THE HOUSE ARMED SERVICES COMMITTEE

## SUBCOMMITTEE ON TACTICAL AIR AND LAND FORCES

**SUBJECT: Fiscal Year 2004 Air Force Science and Technology**

**STATEMENT OF: General Lester L. Lyles**
**Commander, Air Force Materiel Command**
**and**
**Major General Paul Nielsen**
**Commander, Air Force Research Laboratory**

**July 2003**

**NOT FOR PUBLICATION UNTIL RELEASED**
**BY THE ARMED SERVICES COMMITTEE,**
**UNITED STATES HOUSE OF REPRESENTITIVES**

## *INTRODUCTION*

Mr. Chairman, Members of the Subcommittee, and Staff, Gen Nielsen and I very much appreciate the opportunity to provide written testimony on the Fiscal Year 2004 Air Force Science and Technology (S&T) Program, specifically those S&T programs based here at Wright-Patterson Air Force Base (AFB), Ohio. The United States Air Force is transforming to a capabilities-focused Expeditionary Air and Space Force. We are doing this through the development of the Concept of Operations for each of the seven major tasks the Air Force must be capable of accomplishing. Our goal is to make the warfighting effects and the capabilities we need to achieve them the drivers for everything we do. This is especially true in our S&T Program. We have a high correlation between our S&T programs and the capabilities required by the Concepts of Operations. This is because the Air Force Research Laboratory (AFRL), headquartered here in Dayton, closely links the technologies reflected in its S&T Plan to warfighter capability needs.

The United States Air Force and the Air Force Materiel Command (AFMC) are committed to a robust S&T Program that enables us to achieve our vision of becoming an integrated air and space force capable of rapid and decisive global engagement. By continuing our investment in transformational technologies that support a reduced cycle-time, spiral development acquisition process, the Air Force will retain its dominance of air and space in future conflicts, against both traditional and asymmetrical threats.

Innovation is a vital part of our heritage and is key to ensuring the Air Force will meet the challenges of tomorrow. Transforming our warfighting capabilities towards this end will involve continued innovations in how we think about employing our forces to defend our nation, as well as quantum leaps in our technology. We must be prepared to counter regional instabilities, the worldwide availability of advanced weapons, and other emerging and less predictable asymmetrical threats. We are developing transformational technologies that permit flexible forces to operate far from home, on short notice, and for extended time periods. However, we must also be able to afford these innovations once we develop them in order to re-capitalize the Air Force to fulfill our vision. To meet these objectives, we search out the most promising and affordable technologies in order to win decisively, protect our forces, and minimize collateral damage.

Here at Wright-Patterson AFB and throughout AFMC, our mission is to plan, develop, field, and sustain integrated air and space capabilities for dominant warfighting effects—today and tomorrow. AFMC accomplishes this mission by executing more than $7 billion of the President's Budget (PB) and by relying on the innovative abilities of its nearly 83,000 government employees, including Air Force officers, enlisted personnel, and civilians. As well as providing air and space capabilities for dominant warfighting, many of the technologies and products we've developed have greatly impacted our nation's homeland security by providing innovative technology to first-responders, such as firefighters and emergency medical crews. You'll hear more about these technologies later.

### *S&T BUDGET/SENIOR LEADERSHIP INVOLVEMENT*

We have been faced with the reality of a fiscally-constrained, but operationally-demanding environment. The high operations tempo the Air Force has sustained in support of peacekeeping operations and conflicts in Afghanistan and Iraq have placed a great burden on our people and system.

In spite of these requirements, the Air Force is working to increase S&T funding, while maintaining a balanced S&T portfolio. The Air Force Fiscal Year 2004 PB request for S&T is $2.2 billion, an increase of more than $535 million from the Fiscal Year 2003 PB. The most significant change in the S&T PB request results from the devolvement of $350 million for several Office of the Secretary of Defense efforts to the Air Force S&T Program. This includes the High Performance Computing Modernization program, the University Research Initiative program, and the High Energy Laser program. Another significant addition to S&T in Fiscal Year 2004 is over $150 million for the National Aerospace Initiative.

The Air Force understands the concerns of Congress regarding the level of support for these devolved programs and is working hard to ensure execution of the programs transferred to the Air Force continues to support the diverse multiple military objectives inherent in each of these programs. Further, the Office of the Secretary of Defense will continue to provide policy guidance and oversight for these efforts.

In conjunction with the increase in S&T funding, there has also been a significant increase in the involvement of the warfighting commands and senior Air Force leadership in the planning, programming, and prioritizing of Air Force S&T. For example, we have conducted S&T Summits where the Secretary of the Air Force, the Air Force Chief of Staff, and the Air Force four-stars and other senior leaders review the S&T portfolio. The latest S&T Summit focused on transformational technologies that can be developed to assist in combating terrorism and other asymmetrical threats.

The Air Force also uses military construction (MILCON) funding to replace its aging base infrastructure. For example, if you look around here at Wright-Patterson, you'll find numerous MILCON projects aimed at moving our workforce into high-tech research complexes and modernized office facilities. AFRL's Sensors and Air Vehicles Directorates have recently completed major MILCON projects totaling over $30 million to modernize and upgrade aging research facilities. The Human Effectiveness Directorate is currently working on a $15 million MILCON project to house the tri-Services toxicology facility, which is slated for completion in the fall of 2003. The Aeronautical Systems Center (ASC) is currently expanding its Acquisition Management Complex and future plans include a new Information Technology Complex to be built in two phases.

### *COMBATING TERRORISM—A SYSTEMS PERSPECTIVE*

The war on terror has been waged in far away countries by our soldiers, sailors, and airman, but support for that war begins right here at Wright-Patterson AFB. Lt Gen Richard Reynolds commands the ASC here in Dayton, which is responsible for the procurement of almost every major weapons system in the Air Force inventory. Many of these systems have greatly aided the war on terrorism, including the Global Hawk, Predator, and Litening ER and Link 16 programs.

The Global Hawk team here at Wright-Patterson continues to develop, test, evaluate, and execute program requirements, while simultaneously providing invaluable intelligence, surveillance, and reconnaissance capabilities to support warfighters in the global war on terrorism. Global Hawk supported Operation Enduring Freedom in Afghanistan and Operation Iraqi Freedom, flying more than 1,000 hours, taking more than 15,000 high-resolution images through electro-optical, infrared, and synthetic aperture radar sensors in Afghanistan and providing combat capability to the combatant commander in Iraq. During Operation Iraqi Freedom, Global Hawk flew only three percent of air-breathing imagery intelligence missions and five percent of high-altitude reconnaissance sorties, yet accounted for fifty-five percent of time-sensitive targets generated to kill Iraqi air defense equipment.

The Predator, which was also developed at Wright-Patterson, continues to be an important tool in the prosecution of the war on terrorism, identifying and destroying suspected al-Qaeda terrorist hideouts and vehicles, as well as Iraqi missile support vans and anti-aircraft artillery sites. During Operation Iraqi Freedom, Lt Gen "Buzz" Moseley, Coalition Forces Air Component Commander stated, "Every day we've had Predators over the top of Baghdad looking for surface-to-air missile radars, looking for missile launchers he's got up...and also looking over some of the leadership targets that we struck to help us determine whether we have to re-strike them." Both the Predator and Global Hawk are highly dependable, sustaining on-time mission capable rates of greater than 95 percent.

Wright-Patterson's F-15 and Precision Strike System Program Offices equipped F-15Es with the extended range Litening ER pod, which allows positive identification of ground targets at much greater distances than the Low Altitude Navigation and Targeting Infrared for Night (LANTIRN) targeting pod. By using the newly fielded Link-16 data communications link, Litening ER passes those targets to flight members and other air-to-ground attack aircraft. Through a streamlined acquisition process, ASC integrated and tested the pod in just 90 days, awarded the contract three business days after funding, and delivered 20 of 24 pods just five days later, resulting in a significant increase of Operation Iraqi Freedom targets identified and destroyed.

Two other Wright-Patterson efforts worth mentioning are the Stock Control System (SCS) and the Air Force Enterprise Data Warehouse (EDW). Superior logistics support was instrumental to the overall success of OIF, and the SCS used by the Marine Corps was a vital link in the supply chain. The War Reserve system released 18,875 line item requirements into the SCS, generating issue documents when assets were available for issue and generating the appropriate buy request when assets were not available. This tool was used by the Marine Corps Inventory Control Point to track the status and action of these requirements to ensure they were provided to support the war effort. The EDW service was used in several capacities to support OIF, including operational status reporting and contingency planning within the supply and maintenance domains. Also, EDW is powered by homegrown technology from the NCR Corporation. The NCR Teradata data warehouse technology provides unmatched performance allowing the rapid execution of complex queries on terabytes of data.

## *WORKFORCE*

The Air Force scientist and engineer (S&E) workforce is another area where senior Air Force leadership involvement plays a pivotal role. Both Secretary Roche and Gen Jumper are deeply involved in shaping our future S&E workforce. Air Force civilian and military S&Es are highly motivated and productive. The Air Force is unique in that 20 percent of its laboratory S&E government workforce is active duty military. This gives us a direct link to the warfighter. Some of these military S&Es come directly from operational commands, while others will serve in operational commands later in their careers.

The Air Force is committed to shaping its S&E workforce with the vision to enhance excellence and relevance of S&T into the 21st Century and appreciates the support Congress has already provided. This challenge requires the Air Force to maintain a dominant edge in technology and also requires us to provide clear direction and growth for our S&E workforce.

However, we, as do others, find it is difficult to recruit and retain S&Es. The Air Force has several initiatives, both civilian and military, that address recruitment and retention issues.

The shortage of S&Es needs the continued involvement of our nation's leaders. To grow more S&Es, we need to revitalize the nation's aerospace vision and strategy, while encouraging the nation's youth to pursue science and engineering careers. The Wright Brothers Institute was created to facilitate the development of world class, aerospace science and technology collaborations, involving the best S&Es from government, industry, and academia to enhance our nation's global dominance in air and space. Operating from the birthplace of aviation, the Institute helps shape the nation's future in air and space by continuing the Wright Brothers' legacy through the 21st Century.

AFRL was the first laboratory in the Department of Defense (DoD) to take advantage of legislation allowing us to experiment with alternative personnel management systems for our civilian S&Es. The simplified classification system, broad payband levels, and contribution-based compensation that form the cornerstone of the Air Force Laboratory Demonstration Project have provided AFRL with some key flexibilities and has enabled AFRL to compete with private industry for critical S&E talent. The contribution-based compensation system provides AFRL managers the ability to properly compensate high contributors. We will need to consider these flexibilities as we implement the National Security Personnel System (NSPS).

We have found that our centers have the greatest difficulty in recruiting high quality minority member scientific and engineering candidates. We have implemented a command-wide recruitment program targeting this group of highly sought after candidates. The following is a list of national career fairs that we have attended or plan to attend this year: Black Engineer of the Year Award Conference; Society of Hispanic Professional Engineers Conference; National

Society of Black Engineers Conference; and Hispanic Engineering National Achievement Awards Conference. We provide the resumes that we obtain from these conferences to our center civilian personnel offices as a ready source of high quality applicants. This targeted recruitment, in conjunction with the hiring flexibilities of the Federal Career Intern Program, is enabling us to make more timely offers to highly sought after S&E graduates. To ease the confusion that applicants for the AFMC positions can experience, we developed a public web page, which explains what we have to offer and how to apply for specific vacancies. The page links to each center's public web page for more detailed center explanations.

Other civilian initiatives include the recruitment of college students with critical S&E skills via recruiting incentives, a robust marketing effort, and a co-op central funding program that hires college students while still in school. Central funding for recruiting bonus and retention allowance for journeyman level S&Es also promises to provide much needed assistance with civilian recruitment and retention.

On the military side, we're employing the Airman Education and Commissioning Program and the Technical Degree Sponsorship Program to recruit additional S&Es into the military workforce. Bonus programs such as the Critical Skills Retention Bonus are essential to shrinking the current shortfall of military S&Es within the Air Force and the Air Force is currently exploring additional bonus programs.

The Air Force is committed to its S&Es and recently published a "Concept of Operations for Scientists and Engineers in the United States Air Force." We also baselined the requirement for the Air Force S&E workforce and, upon analyzing this baseline requirement, found that while our military and civilian authorizations were about right, our actual demographics were seriously short in some key areas. As such, we are shifting our focus to retaining the workforce we have and infusing it with the vitality of new S&Es to meet tomorrow's need. During the next seven years, we are investing nearly a third of a billion dollars to support the retention and reshaping of our technological workforce. As we replenish our S&E workforce, we are providing career guidance and mentoring that will enable us to meet our 21st Century challenge. Initiatives, such as the special hiring legislation authorized by Congress in Public Law 106-398, which provides "DARPA-like" hiring authority to the Military Departments, should also produce positive results in shaping our S&E workforce. This authority has only recently been delegated to the Air Force, but we are optimistic about its potential. And, again, we express our thanks to Congress for your continued support.

A unique aspect about the S&E environment here at Wright-Patterson is that the Air Force Institute of Technology (AFIT) is also located here. For over 80 years, AFIT has met the ever changing and challenging scientific, engineering, and technical management needs of the Air Force. AFIT's mission is to produce graduates and engage in research activities that enable the Air Force to maintain its scientific and technological dominance. Through the accomplishment of this mission, AFIT students and faculty work hand-in-hand with S&Es across the AFRL Technical Directorates here at Wright-Patterson. AFIT also acts as a pipeline for S&Es to the labs, with more than 260 Air Force officers in the lab owning AFIT degrees.

## *MAXIMIZING OUR S&T DOLLARS*

We will continue to leverage technology to achieve new levels of combat effectiveness. Our strategy is to pursue integrated technology capabilities that support our warfighter's highest priority needs. We must also pursue the fundamental enabling technologies that will improve tomorrow's Air Force. As technological superiority is increasingly a perishable commodity, we work hard to optimize our S&T funding, by not only "inventing the future" ourselves, but also by speeding the introduction of new technologies to our warfighters.

One way we are doing this is through our Applied Technology Councils and the Advanced Technology Demonstrations (ATDs). The councils are composed of two- and three-star representatives from AFRL, our acquisition product centers, and our major user commands who formally prioritize ATD programs. We hold an Applied Technology Council meeting with each Major Command twice every year and have commissioned 34 ATDs that have transition funding in the Fiscal Year 2003 budget. The Applied Technology Council process is extremely important in linking the S&T Program to both the system developers and the operational user. This process facilitates technology transition to operational use and secures user commitment for resources to do systems design and development and fielding of the technology. Currently about fifty percent of our Advanced Technology Development (6.3) budget is committed to these programs.

Since deployed technology may remain in use for decades, the Air Force S&T Program not only focuses on enhancing performance, but also on sustaining our fielded warfighter capabilities. Emphasizing affordability from the very beginning through training of our management, and science and engineering staff, as well as through an in-depth review of technology development efforts, increases our potential to reduce the costs of technology early in the system development process and throughout a product's life cycle.

We maintain an excellent balance of military, civilian, and contractor expertise, which allows us to be very selective about investing in high payoff technological opportunities. We constantly seek opportunities to integrate Air Force planning and leverage our S&T funds by cooperating with other Services, Agencies, the private sector, and international partners. For example, we rely on the Army as the lead Service for defensive chemical-biological technology development. The Air Force also has strong inter-Agency efforts, such as our program in aging aircraft, which is focused on detection and management of corrosion and fatigue in aging structures. It is closely coordinated with the civilian aging aircraft research programs at the National Aeronautics and Space Administration (NASA) and the Federal Aviation Administration (FAA). Our partnership with the industrial and university research base is very strong. In fact, over seventy percent of our S&T funding goes to universities and private sector contractors. Finally, the Air Force is involved in international cooperative technology development efforts for S&T, such as the software defined radio development, insensitive high explosives, and aircraft battle damage repair efforts conducted with France, Germany, and the United Kingdom. Another example of international cooperation is the multi-domain network management program with Australia and Canada. This program is developing the concepts and tools for creating and managing secure computer networks with our coalition partners.

The majority of Air Force S&T is contracted with industry and universities. This promotes relationships between the scientists and engineers conducting the research and lays the foundation for technology transition. Strong connections between the technology supplier and the end user help speed transition of technology to the warfighter. In addition, the various transition programs in which the Air Force participates further cement this foundation. Air Force technology transition efforts include the previously discussed ATD projects, Small Business Innovation Research (SBIR) contracts, and Cooperative Research and Development Agreements (CRADAs) among others.

The SBIR program funds early-stage efforts at small technology companies. These programs serve a defense need, but also have the potential for private sector and/or military market commercialization. A CRADA is an agreement between a government laboratory and a non-federal party under which the laboratory provides personnel, facilities, equipment, or other resources (but not funds) with or without reimbursement and the non-federal party provides funds, people, services, facilities, equipment, or other resources to conduct specific research and development efforts that are consistent with the agency's mission.

These efforts along with many other programs, such as Dual-Use S&T, Independent Research and Development, Mentor-Protégé, Personnel Exchanges, etc., are mutually beneficial to the Air Force and the contractors and universities with whom we collaborate. Technology transition is a key component of maximizing the Air Force S&T budget and is vital to our pursuit of national security requirements.

### *S&T SUPPORT TO COMBATING TERRORISM*

While the traditional focus of S&T has been on developing long-term capabilities, the Air Force S&T Program also contributes to the current needs of the nation and our troops deployed in hostile areas. One example of an Air Force project receiving a great deal of attention since 9/11 is the Exterior Explosive Blast Coating polymer, which was developed by the Air Force to protect key buildings and installations from close proximity explosions, such as air dropped weapons or truck bombs. This easy-to-apply spray coating provides greater structural integrity of exterior walls and prevents dispersion of debris as well as separation of wall elements. This coating is currently being applied to the interior of the outer walls of the Pentagon.

In the war on terror, Air Force Special Tactics Combat Controllers are changing the very nature of warfare. By performing operations deep in enemy territory, they help determine who the terrorists are, where their weapons are located, and who the innocent civilians are. Then, they precisely control the elements of airpower to defeat the terrorist threat, while taking care to spare innocent civilian casualties and minimize collateral damage. Then, these same Special Tactics Combat Controllers are there to provide instant battle damage assessment. We call these deep engagements, "Battlefield Air Operations (BAO)."

AFMC is providing needed help for these brave Special Tactics Warriors. AFRL is accelerating new technology to these Special Tactics Warriors in the form of significant improvements to their BAO Kit of equipment. ASC is providing a Special Tactics System Program Office to assist in rapid procurement of these new BAO Kit items. The Electronic Systems Center is helping to ensure these new digital machine-to-machine data communications are interoperable with the rest of our Global Grid of military command and control communications systems. As a result of this AFMC-wide enterprise, our Special Tactics Warriors will soon have a digital machine-to-machine capability that helps to quickly connect the right aircraft, with the right munitions, guided precisely to the right target, at just the right time, to achieve the desired effect. This new automated process helps to reduce the time it takes to target the terrorist threat, while at the same time reducing human error in the targeting process.

Working collaboratively with the Special Tactics Warriors, this AFMC "BAO TIGER TEAM" has also partnered with a national team of industry to field significant enhancements of increased capability, while reducing the weight and size of the individual BAO Kit equipment. They are performing these improvements by developing, prototyping, testing, building, and fielding these BAO Kit improvements in very rapid spirals. These new BAO capabilities will help to save American lives, and the lives of innocent civilians. BAO provides a revolutionary and highly effective way to combat the terrorist threat.

One of our premier munitions, Crash PAD (Prompt Agent Defeat), recently transitioned from the munitions lab at Eglin Air Force Base into acquisition. The objective of the Crash PAD program is to demonstrate a blast/frag multi-purpose warhead that can be used to damage fixed biological and chemical targets, while producing an environment that will mitigate bio agent collateral damage. The range of applicable targets includes soft to moderately hardened. This program has the potential to be a significant resource for the warfighter in destroying chemical and biological weapons with minimal effects to civilians.

Working closely with operational users, AFRL researchers in the Materials Directorate here at Wright-Patterson continue to develop and transition new filter technologies that provide improved eye protection for aircrews from varied levels of laser threats. The Laser Eye Protection program is enabling aircrews to conduct day and night air operations without visual jamming or personal injury. Within AFRL's Human Effectiveness Directorate, the Integrated Panoramic Night Vision Goggle (IPNVG) program is an initiative to improve the warfighters' safety and operational capability at night by increasing their night vision field of view. It will also provide protection from laser target designators, laser rangers, and laser threats through compatibility with existing laser eye protection technologies. The IPNVG technology is transitioning to final development and eventual production through the Fighter Bomber System Program Office of ASC. The Information Directorate at Rome, New York, is currently developing a Cyber Security System designed to meet the information assurance needs of the military and law enforcement communities. The finalized system will also implement an enterprise protection plan, which will provide an overall cyber awareness plan, minimizing threats to business and academic networks.

AFRL researchers are also working diligently to bring innovative technology to first-responders in both the military and civilian communities. As a spin-off of IPNVG technology, the Materials Directorate has recently delivered life-saving vein viewing technology to the medical community. This vein viewer device will provide both the Air Force and medical community a reliable, accurate, and inexpensive point-of-care device for use in conditions where the lighting is less than optimal, such as battlefield and accident scenes. Other Materials initiatives include Emergency Response Casualty Location, which reduces risk to first-responders by identifying unstable areas, as well as a number of improved firefighting technologies, including new firefighting agents, an advanced firefighting vehicle that includes robotic operated stand-off capability, and evolutionary command and control technologies integrated into firefighter helmets.

Another lab technology application with potential use by first-responders is the Vehicular Mounted Active Denial System (VMADS). A joint development with the U.S. Marine Corps, VMADS is a defensive millimeter wave system used for perimeter defense applications. VMADS is a directed energy weapon that emits a non-lethal, non-damaging beam, which heats up the skin of a potential enemy when in close proximity to the system. The resulting temporary pain causes the person to flee.

The Directed Energy Directorate at Kirtland AFB in New Mexico has applied ultra-wide band, short pulse microwave technology to design a detection and identification of concealed weapons device, developed for use in urban combat and hostage situations. This technology will allow both warfighters and first-responders the ability to see through walls to locate and identify weapons. While providing critical support at the location of the 9/11 World Trade Center incident, the Information Directorate successfully transitioned mobile communications capability technology to an immediate real-world application. In addition to diverse logistical and planning support, the Directorate contributed to the provision of overhead imagery of Ground Zero and transitioned the Joint Defensive Planner to operational use, thus enabling first time visualization capabilities of all aircraft flight plan profiles and information sharing between the FAA and the North American Aerospace Defense Command (NORAD). The 10th Mountain Division was requested and deployed with the Portable Interactive Datawall to Afghanistan, while obtaining a second system for Continental United States (CONUS) collaboration.

One final example of Air Force technology with first-responder application is the Joint Firefighter Integrated Response Ensemble (J-FIRE). Developed by the 311th Human Systems Wing at Brooks City-Base in Texas, J-FIRE is state-of-the-art firefighting clothing, designed to provide chemical/biological (CB) protection during firefighting operations. Combining previous CB protective garments with firefighting gear created severe and debilitating heat stress that was magnified and compounded by the nature and environment of firefighting duties. Testing of the J-FIRE system has shown that the ensemble provides chemical protection equivalent to standard CB garments and fire protection approved by the National Fire Protection Association without inflicting increased heat stress and bulk that would limit firefighter performance.

## *WORLD CLASS RESEARCH*

The quality of our program is assessed by the Air Force Scientific Advisory Board (SAB) through yearly reviews. The SAB conducts an in-depth review of half of the S&T Program each year, covering the entire program over a two-year period. Twelve technical areas have been identified as world class research during the last cycle of reviews -- let me highlight a few of these areas that were identified as world class.

The Directed Energy Directorate's Starfire Optical Range at Kirtland AFB, New Mexico, is leading the adaptive optics research for use in large ground-based telescopes to image satellites and propagate laser beams through the atmosphere. This will enable high-quality, ground-based observations of space objects and propagation of laser beams through a turbulent atmosphere. Astronomical images using this technology can rival those obtained with the Hubble Space Telescope.

Our Propulsion Directorate's Hypersonics Technology (HyTech) work here at Wright-Patterson AFB is acknowledged by the SAB as world class and it's a cornerstone of the Office of the Secretary of Defense's Director of Defense Research and Engineering's (DDR&E's) National Aerospace Initiative. Our HyTech program has continued to advance the state-of-the-art in scramjet engines and conducted the first ever ground test demonstration of a scramjet producing positive net thrust back in 2001. In February 2003, HyTech tested a flight weight scramjet Ground Demonstration Engine operating at Mach 4.5. While the 2001 Performance Test Engine used copper heat-sink hardware and weighted 1,500 pounds, the 2003 Ground Demonstration Engine used JP-7 fuel to cool the scramjet engine walls and weighed less than 150 pounds. This marked another first for the HyTech program—demonstrating the structural durability of a hydrocarbon fueled, actively cooled scramjet. Testing at Mach 6.5 was recently completed in June 2003. Pratt & Whitney developed this particular engine in collaboration with Air Force scientists and engineers.

Another SAB-rated world class research program is the Warfighter Skill Development and Training efforts worked by our Human Effectiveness Directorate at Brooks City-Base, Texas. Distributed mission training will provide an integrated set of training, simulation, and mission rehearsal technologies that will improve warfighter capabilities and mission readiness by enhancing operator and team performance skills. Technologies will increase operational readiness by providing more effective methods and approaches to train and assess personnel. These technologies will contribute to a more highly trained and flexible cadre of personnel at a reduced cost.

Our research in Electro-Optic Warfare, also here at Wright-Patterson, will allow future laser-based sensor systems to penetrate moderate cloud cover, obscurants, and camouflage. This will provide improved target detection and identification for our weapon systems. "See and Avoid" sensors will ease restrictions on unmanned air vehicle operations in civilian airspace and allow autonomous operation in conjunction with manned aircraft. These technologies may also be applied as low-cost missile warning sensors to affordably protect military and commercial aircraft from surface-to-air missiles. Also, experimental research in infrared countermeasures is developing threat adaptive techniques for robust defeat of current and future infrared weapons and sensors.

At Edwards Air Force Base, California, the Propulsion Directorate is working on world class research in polynitrogen propellants. The goal is to enable high performance monopropellant rocket propulsion systems with revolutionary performance. By improving the specific impulse of the propellant, we will have environmentally benign exhaust and reduced signatures. This could potentially improve storage, manufacturing, and rocket engine size.

The Materials Directorate's Laser Hardened Materials effort leads the world in the development and evaluation of laser protection technologies and devices. This world class, multidisciplinary team is the world leader in the development of laser protection for sensors and eye protection, and their work on biotechnology, specifically biomimetics, has been ground-breaking.

Wright-Patterson's Air Vehicles Directorate has also performed world class rated research in the area of Sustainment for Capabilities Enhancement. This research area provides enhanced capabilities for two programs supporting the C-17 program: Weapon Bay Flow Control and Active Core Exhaust (ACE). The Weapon Bay Flow Control program is developing technology for suppressing flight instabilities caused when the weapon bay door is open in flight. The ACE program is developing technology to remove the engine core thrust reverser, thus improving maintainability, reducing operations and support costs and lowering overall air vehicle weight.

## *TRANSFORMATIONAL TECHNOLOGIES*

There are many other Air Force technology areas that deserve special mention. Let me highlight just a few examples. First, there's our transformational communications technology development program, whose laser communications technology efforts promise to increase data transfer rates at least ten-fold compared to current radio frequency communications systems. Additionally, laser communications uses a narrow beam, which decreases the likelihood of intercept and increases resistance to jamming. While laser communications have a high potential to revolutionize satellite communications, there are technical challenges to overcome such as precision pointing and tracking, weather constraints, and adapting the equipment for use in space. We continue to work on the technology challenges and are also conducting a study to determine the best architecture for implementing laser communications technologies to complement and integrate with radio frequency-based systems.

To increase aircraft survivability and operational efficiencies, the Air Force is developing both manned (F/A-22 and Joint Strike Fighter) and unmanned flight vehicles that can carry and employ weapons from both external and internal weapons bays. To increase the number of weapons the flight vehicle can fit into their internal weapons bays, part of our investment strategy focuses S&T funding on developing and demonstrating smaller precision weapons.

One of the small munitions currently being flight demonstrated at Eglin Air Force Base is the Low Cost Autonomous Attack System (LOCAAS). The LOCAAS is a 100-pound class powered munition of which the primary target set is moving and relocatable targets. This Advanced Technology Demonstration (ATD) program will demonstrate the effectiveness and military utility of this type of munition for the Lethal Suppression of Enemy Air Defenses (SEAD), Theater Missile Defense (TMD) Attack Operations, and Armor/Interdiction mission areas. LOCAAS will integrate a laser radar precision terminal seeker with autonomous target recognition algorithms, a multi-modal warhead, Global Positioning System (GPS)/Inertial Navigation System (INS) mid-course guidance, and a miniature turbine engine with a fly-out range of 100 miles. This ATD program will complete five flight tests by the end of Fiscal Year 2003, culminating in a planned autonomous flight with active seeker and warhead against a real target. The first flight test was successfully completed on February 4, 2002, and demonstrated the powered flight envelope, GPS waypoint navigation, and simulated attack of a SEAD target. The second flight test, successfully completed on November 4, 2002, was a guided LOCAAS that demonstrated real-time autonomous search, and automatic target acquisition algorithms that could detect, identify, and simulate attack against a TMD target.

Plans are also being made in Fiscal Year 2004 to conduct a cooperative program with the Royal Australian Air Force (RAAF) using the LOCAAS vehicle. A test program on the RAAF F-111 aircraft in Australia is scheduled for the first quarter of the fiscal year. This will be an important test for both nations – the U.S. is able to test munitions release at supersonic speeds and Australia benefits from the test results. These results could enable maturation of the computational simulation codes for separation of symmetric and asymmetric miniature weapons, providing for a reduction in the risk and cost of weapons certification efforts for aircraft with internal weapons bays such as the F/A-22, Joint Strike Fighter, and Unmanned Combat Air Vehicles (UCAVs).

To continue the trend of miniaturization of space platforms, the Air Force and Defense Advanced Research Projects Agency (DARPA) have provided funding to ten universities to explore the military utility of innovative, low-cost nanosatellites. These nanosatellites, weighing two to ten kilograms, could demonstrate efforts such as differential GPS navigation, miniaturized sensors, and micropropulsion technologies. In December 2002, two "pico satellites" weighing slightly more than two pounds each were successfully released from a specialized spring-loaded launcher assembly mounted on the sidewall of the Space Shuttle Endeavor. This was the joint Air Force/DARPA-developed PICOSAT Inspector experiment to demonstrate a significant step forward in the development of an on-board autonomous inspection capability.

The Air Force is also conducting the Experimental Satellite System (XSS) series to demonstrate increasing levels of microsatellite technology maturity. The XSS-10 is the first microsatellite in the series and was launched on schedule during Fiscal Year 2003. It demonstrated semi-autonomous operations and visual inspection in close proximity of an object in space—in this case a Delta II upper stage. In Fiscal Year 2004, we plan to launch XSS-11, which will demonstrate autonomous operations and provide experience with command and control in proximity operations to another space object.

One of the most transformational and quickly deployable technologies available today is command, control, and communications technology, also known as information technology. This technology is at the heart of our Moving Target Indicator Exploitation program, which is developing web-enabled automated tools to exploit data from current and future sensor systems such as the Joint Surface Target Attack Radar System, better known as JSTARS. The effort is focused on four technology areas: ground moving target tracking; motion pattern analysis; behavioral pattern analysis; and sensor resource allocation and scheduling, which provide the capability to track moving targets and get the information to the operations center. This system is in southwest Asia today.

AFRL's Air Vehicles Directorate is developing transformational technology in the area of autonomous flight operations, specifically auto aerial refueling to extend the operational range of Unmanned Aerial Vehicles (UAVs). The application of autonomous control technology provides a powerful tool to the warfighter by providing on-site, rapid, robust, and adaptive response to changing situations and battlefield environments. UAVs could be refueled in order to extend operational range and safe operations around a tanker (either manned or unmanned) require high levels of coordination and precision maneuvering. Technologies for safe airspace operations are being developed, initially focusing on UCAV transition, but maintaining ultimate relevance for all categories of UAVs.

### *BREAKTHROUGH TECHNOLOGIES*

In recent years, we have all come to appreciate the success of unmanned vehicles. We hear over and over again the tremendous operational advantages that systems such as Predator and Global Hawk are bringing to warfighters from all Services. Over the first two decades of the 21st Century, advances in micro unmanned air vehicles will provide significant additional capabilities to our Armed Forces. Micro air vehicles utilize advances in microscale aerodynamics, electronic miniaturization, munitions, and propulsion to package sensory and weapons payloads into highly reliable, on-demand systems. These systems will provide unprecedented levels of situational awareness in the most severe threat environments. Whether we are operating in urban environments, sensing bio-chemical dispersion through the atmosphere, or looking over the next hill, our troops will have the awareness needed to fight and survive. These systems will provide the persistent intelligence, surveillance, and reconnaissance in high threat environments needed by our troops on the ground and our airmen in the air. When called for, swarms of these vehicles will cooperate together to generate both lethal and nonlethal effects.

In the next 50 years, advancements in nanotechnology will provide the greatest change in how man operates since the invention of powered flight itself. Nanotechnology is a science and a series of disciplines that works at the atomic and molecular level to create structures, materials, and devices through improved molecular organization. By working with elements at the level of nanometer scale, we have access to the building blocks of nature. This will fundamentally change the way materials and devices will be produced in the future. The ability to synthesize nanoscale building blocks with precisely controlled size and composition and to then assemble them into larger structures with unique properties and functions will revolutionize segments of the materials and device industry. The benefits that nanostructuring can bring include lighter, stronger, and programmable materials; reductions in life cycle costs through lower failure rates; innovative devices based on new principles and architectures; nanosensors and nanoprocessors;

and use of molecular/cluster manufacturing, which takes advantage of assembly at the nanoscale level for a given purpose.

Another significant breakthrough technology that will change the way we develop systems is our work in biotechnology. Biology has developed unique materials and processes that may be exploited in non-biological systems. We are studying the fundamental science necessary to incorporate biological components and organisms into Air Force systems. For example, in biomimetics, we research the adaptation of natural biological sensor in reptiles. The natural infrared sensors in reptiles do not need to be cooled. We hope to adapt this biological process to Air Force sensor applications that normally require cryogenic cooling.

### *SECTION 253 STUDY*

Section 253 of the National Defense Authorization Act for Fiscal Year 2002, Public Law 107-107, directed the Air Force, in cooperation with the National Research Council of the National Academy of Sciences, to carry out a study to determine the effect of Science and Technology (S&T) program changes of the past two years. The findings contained in the written report prepared by the Air Force Science and Technology Board (AFSTB) of the National Research Council indicate that overall the Air Force has made considerable progress during the past two years in strengthening its S&T Program. This report noted that great progress has been achieved in increasing the visibility of the S&T portfolio within the Air Force through the new S&T Summits, the Applied Technology Councils, and the transfer of S&T budget management to Air Force Materiel Command. At the same time, the AFSTB does challenge us to continue working to stabilize our funding levels, strengthen our workforce, and reestablish the development planning process. As the report indicates, however, we have already begun many initiatives targeted towards strengthening these areas and will continue to pursue them in the future.

## *CONCLUSION*

In conclusion, the Air Force and all of us here at Wright-Patterson AFB are fully committed to providing this nation with the advanced air and space technologies required to meet America's national security interests around the world and to ensure we remain on the cutting edge of system performance, flexibility, and affordability. The technological advantage we enjoy today is a legacy of decades of investment in S&T. Likewise, our future warfighting capabilities will be substantially determined by today's investment in S&T. As we face the new millennium, our challenge is to advance technologies for an Expeditionary Air and Space Force as we continue to move aggressively into the realm of space activities. The Air Force is confident that we can lead the discovery, development, and timely transition of affordable, transformational technologies that keep our Air Force the best in the world. As an integral part of the Department of Defense's S&T team, we look forward to working with Congress to ensure a strong Air Force S&T Program tailored to achieve our vision of an integrated air and space force.

Mr. Chairman, thank you again, for the opportunity to present written testimony, and thank you for your continuing support of the Air Force S&T Program.

# QUESTIONS AND ANSWERS SUBMITTED FOR THE RECORD

JULY 19, 2003

## QUESTIONS SUBMITTED BY MR. WELDON

Mr. WELDON. After taking into account the movement of programs under the Air Force science & technology topline that previously had not been there (for example, programs devolved from OSD), the FY 2004 budget request for the continuing Air Force S&T program was less than the amount that was appropriate for FY 2003. Similar reductions appear to be in place for FY 2005. How will these reductions improve the effectiveness of the Air Force S&T program? How will they satisfy the Air Force S&T investment objective stated by congress in both the FY 1999 and FY 2000 Defense Authorization Acts?

General LYLES. The Air Force Science and Technology (S&T) Program is funded at a level to achieve the distinctive capabilities supporting Air Force core competencies. At $2,197 million, the Fiscal Year 2004 President's Budget (PB) request for Air Force S&T reflects an increase of $537 million over the Fiscal Year 2003 PB request of $1,660 million. Subtracting the $355 million in funding stemming from the programs the Office of the Secretary of Defense devolved to the Air Force brings this down to $1,842 million. If other "non-traditional" funding, such as Special Programs and Transformational MILSATCOM is removed from the Fiscal Year 2003 and Fiscal Year 2004 PB requests, these amounts equal $1,367 million and $1,472 million, respectively. While the Fiscal Year 2004 PB request is lower than the Fiscal Year 2003 appropriated amount, this will not affect laboratory operations since the Air Force does not base the planning, programming, and budgeting of its S&T Program on prior year Congressional Add funding. This holds true for any differences that may exist between the Fiscal Year 2005 PB, currently under development, and the pending Fiscal Year 2004 appropriations. It is too soon to calculate Fiscal Year 2005 PB real growth, thus we cannot state whether it will satisfy the Congressional investment objectives reflected in both the Fiscal Year 1999 and Fiscal Year 2000 National Defense Authorization Acts that set a goal of two percent real growth for Fiscal Years 2001-2009 over the prior fiscal year. We do know, however, that comparing the Fiscal Year 2003 and Fiscal Year 2004 "traditional" S&T PB requests of $1,367 million and $1,472 million, respectively, real growth equals six percent; well exceeding the Congressional goal of two percent real growth.

Mr. WELDON. The FY 2002 Defense Authorization Act required the Air Force to reinstate and implement a revised development planning process. What is the status of this reinstatement at AFMC?

General LYLES. The Air Force has shifted from a threat-based approach to a capabilities-based approach to making investment decisions and providing for requirements generation planning. The CSAF has rapidly advanced this vision towards Concepts of Operations (CONOPs) based on capabilities. The Air Force recently began a Capabilities Review and Risk Assessment (CRRA) process to examine these CONOPs capabilities, to identify shortfalls and to assess the risk in our ability to deliver those battlefield effects. These documented "capability gaps/shortfalls" will play a key role in the new Capabilities-Based Planning Process. In parallel to this transformation, AFMC has established an Enterprise Leadership construct to focus the entire command on delivering capabilities vice programs alone. All the Enterprise product areas, AFRL, and the MAJCOMs will participate in addressing these critical shortfalls and identifying potential solution sets. The Enterprise Leadership construct is intended to capitalize on, expand, and coordinate our response to achieving resolution of the AF capability shortfalls. To do this we must improve our basic management and analysis capabilities existing in the Product Centers and AFRL to support capability-based planning. General officer forums and improvements in our current Enterprise based summits are being proposed to ensure command attention is focused on capability-based planning and execution of critical command tasks. Operationalizing Enterprise Leadership has become a command imperative. Development planning (now called Capability Planning) will be a vital and fully integrated part of the command's Enterprise Leadership response to the new Capability-Based Planning Process. A critical need is to refocus and even increase where required the funding needed to ensure that Enterprise Leadership delivers on its potential.

Mr. WELDON. Your personal background uniquely qualifies you to be effective in representing and advocating Air Force science & technology within the Air Force. What have you done to institutionalize this advocacy so that succeeding AFMC commanders can be just as effective?

General LYLES. In my tenure as Commander of the Air Force Materiel Command (AFMC), I have institutionalized a number of process changes to ensure continuing advocacy for the Air Force Science and Technology (S&T) Program. A major change was to include programming and budgeting for S&T within the AFMC command process. In the past, planning, programming, and budgeting for S&T efforts were worked directly between the Air Force Research Laboratory and Headquarters United States Air Force. By including S&T as part of the AFMC process, future AFMC Commanders will continue to add their voices in support of the Air Force S&T Program.

Another important change was implemented with the revision of Air Force Policy Directive 61–1, "Management of Science and Technology." This policy directive was revised to reflect current Air Force policy concerning the roles and responsibilities of all Air Force organizations directly involved in the management of the Air Force S&T Program. A significant change to this policy directive included coordination and support for S&T efforts at AFMC.

The Air Force is dedicated to a robust S&T Program that enables us to realize our vision of making the United States Air Force an integrated air and space force capable of rapid and decisive global engagement. The technological advantage we enjoy today is a legacy of decades of investment in S&T and I believe the aforementioned changes lay the foundation for continued advocacy of a strong and robust Air Force S&T Program.

Mr. WELDON. Among the actions that the Air Force took during recent years to increase visibility of its science & technology program and scientist & engineer workforce was the periodic convening of "summits" involving top Air Force leaders. The summits planned for December 2002 were canceled, however, and not rescheduled. Did the summits not achieve their objectives or found to be beneficial? What will the Air Force do instead?

General LYLES. The Air Force Science and Technology (S&T) Summits have proved to be very beneficial, resulting in increased visibility of and support for the Air Force S&T Program. These summits have encouraged dialog among senior Air Force leadership with respect to the direction and objectives of the S&T Program and have led to a greater understanding of the program. However, the logistics of orchestrating one of these summits, especially in this time of heightened military activity in support of Operation Iraqi Freedom, have been extremely challenging. Still, the Air Force is committed to a robust S&T Program and is using several institutional processes to bring visibility of our S&T Program to our senior leadership. S&T underpins the development of new operational capability and provides the foundation for improving our current capability. S&T activity relevant to our Concepts of Operations is reviewed by the Secretary, Chief, and 4-stars during the Capability Reviews and Risk Assessments (CRRAs). In addition, specific areas of research relevant to future transformational directions of the Service are reviewed at our 4-star summits each year. This past year, for example, the summit reviewed Directed Energy research. The Air Force is committed to keeping our senior leadership informed on our S&T programs. Finally, as Air Force Materiel Command Commander, I conduct annual execution reviews with the Air Force Research Laboratory to help direct the future of S&T programs.

Mr. WELDON. General Lyles, in a recent letter to the committee, Secretary Rumsfeld cited the need for "critical technologies and capabilities obtainable only or most economically from non-U.S. sources." Can you describe the technologies required by our military that are available only through foreign sourcing and what is required to establish a U.S. capability in these critical technologies.

General LYLES. The issue with regard to purchasing from non-United States sources is not to identify specific technologies and capabilities, but rather to have the flexibility to select the most economical solution as cited by Secretary Rumsfeld in his recent letter to Congress. It is generally in the best interest of the Air Force and the nation to purchase technologies and capabilities within the United States. However, there are other international technologies or capabilities that could be more advanced and/or more economical than those that can be found in the United States. The Air Force needs the flexibility to decide when non-United States sources are used.

Mr. WELDON. General Lyles, the Air Force recently initiated its National Aerospace Initiative, could you provide us with an idea of the major elements and objectives of the program?

General LYLES. The National Aerospace Initiative (NAI) is a DDR&E (Director, Defense Research and Engineering) initiative to provide an integrated, capability-focused, national aerospace program. The three major elements or pillars of DDR&E's initiative are:

- High-Speed/Hypersonics: The focus of this NAI pillar is to develop and demonstrate technologies that enable airbreathing hypersonic flight for potential application to future missiles, aircraft, and space access systems. The Air Force's hypersonics investment plan also matures technologies enabling these same mission areas.
- Space Access: The NAI plan for this pillar includes the development and demonstration of technologies that enable responsive, safe, reliable, and affordable access to and from space. While future systems include both reusable and expendable elements, the focus was to move as much towards reusable systems as possible. The Air Force has investments that directly support these goals, but also invests in technologies to improve expendable launch systems currently in the Air Force inventory, as well as sustaining the ballistic missile fleet.
- Space Technology: This NAI pillar is aimed at developing and demonstrating technologies that enable transformational and responsive in-space capabilities in intelligence, surveillance, and reconnaissance (ISR); flexible communications; space control; and responsive spacecraft (including the common aero-vehicle or CAV). While the Air Force has core investments in these areas, it also invests in position, navigation, and timing (PNT); environmental sensing; satellite operations; missile warning; and the overall mission area of command, control, and communications (C3).

Mr. WELDON. General Lyles, you mention in your statement about actions you are taking to correct the shortcomings in your personnel management programs. Can you provide a description of the ideal science and engineering workforce demographic, where you are in the process of achieving what your ideal is and tell us if there is any further legislative support you need to assist in achieving your goal?

General LYLES. The Air Force conducted a study called "Science and Technology Work Force for the 21st Century" or STW–21, which determined that an AFRL workforce mix of 48 percent permanent civilian employees, 15 percent uniformed military members, 24 percent collaborative members of private industry and academia, and 13 percent others to include term and temporary employees, Intergovernmental Personnel Act (IPA) employees, and Post-Doctoral employees was optimal. The Air Force Research Laboratory (AFRL) is implementing these recommendations as approved by the Secretary and Chief of Staff of the Air Force and the current AFRL Scientist and Engineer (S&E) workforce is 46 percent civilian, 15 percent military, 35 percent in-house collaborators, and four percent others. At these levels, we are close to meeting the targeted workforce mix and wish to express our appreciation for the support Congress has already provided. However, additional support could be used to implement the National Security Personnel System to provide flexibilities, such as pay banding, streamlined hiring procedures, and a performance-based compensation system across the entire Department of Defense. In addition, other initiatives that support the S&E workforce that could use support include legislation to allow the option to credit private industry experience in granting annual leave accrual credit to new employees as currently contained in the Federal Workforce Flexibility Act, introduced by Senator Voinovich, plus Air Force recruiting and retention initiatives totaling more than $360 million across the Future Years Defense Plan, such as the Critical Skills Retention Bonus, Airman Education and Commissioning Program, Technical Degree Sponsorship Program for the Military, Recruiting Incentives for College Recruits, Co-op Central Funding, Robust College Recruitment Office, Recruiting Bonuses for Journey-Level, Retention Allowances for Journey-Level, and Group Retention Allowance for Civilians.

Mr. WELDON. General Lyles, can you describe the Enterprise Data Warehouse program, its benefits, and its potential uses beyond logistics management?

General LYLES. The Enterprise Data Warehouse (EDW) program will bring together the full spectrum of Air Force combat support data and information required by every member of the Air Force Enterprise who needs readily accessible combat support information to perform analyses and make decisions in support of the Air Force mission. This ranges from the deployed commander to depot-level logistician. Gathering and storing enterprise-wide data in a secure, reliable and consistent manner, the EDW, through the AF Portal, will enable modern decision-support tools to quickly provide clear and accurate decision-making information. Our near-term vision is to provide cross-functional capability supporting logistics-related systems. Our long-term vision is for the EDW to encompass data from across all (22) of the Combat Support domains.

The central benefit of the EDW is a self-service environment for combat operators to reach back into the breadth and depth of cross-functional combat support information required for readiness assessments, crisis action planning, deployments, and employment and sustainment. These activities demand information from every combat support functional area and the ability to identify the impacts of constraints in a single, or multiple areas on the operation as a whole and address them proactively by priority. Enhanced access and analytical query capabilities will provide commanders and war fighters the information needed to look beyond data to verify suspected trends and seek out unknown ones before they restrict combat capability.

The same self-service environment afforded to the combat operators will also be leveraged to effectively manage and plan peacetime support requirements. The combat support business areas are required to sustain an effective fighting force within allocated budgets during peacetime. EDW will provide this capability by establishing, among others, interrelationships between product acquisition and sustainment, personnel, financial plans and other information, greatly improving our insight and management of our war fighting capabilities. Additionally, it will improve areas such as asset visibility (people, places, things), weapon system management, reachback supply operations and contingency planning.

An additional long-term benefit of fielding the EDW will be the ability to reduce our Information Technology infrastructure, especially our dependence on outdated technology still utilized by a number of legacy systems. The EDW will be a centralized repository, accessible by a variety of decision support tools, that will eliminate much of the decision uncertainty associated with the closed, rigid and compartmented combat support information systems in use today.

The potential use of enterprise information beyond logistics is significant to all of our major business and support areas. A few examples include:

- Finance - with financial data available from across the breadth of the Combat Support domains, financial planners will be able to analyze impacts of adjustments in one area and the possible impacts to the other domains.
- Personnel - data on personnel will enable better visibility of overall ability to support the Air Force mission, as well as the ability to forecast Aerospace Expeditionary Force shortfalls. Identified shortfalls in trained personnel could help recruiters and Air Education and Training Command target career fields in the greatest need of "plussing up."
- Acquisition - data in the EDW could be used to analyze performance across our acquisition portfolio. The EDW will provide unique analysis capabilities currently unavailable to the acquisition community. Examples include analysis of past performance in source selections and analysis of expenditure profiles that will give program managers insight into possible high-risk situations.

In summary, the EDW will enable the Air Force to reduce and optimize its IT infrastructure while providing an unsurpassed ability to give decision makers the information required, when they need it, to make the decisions that will ensure Information Dominance well into the 21στ century.

Mr. WELDON. A large part of AFRL funding comes from outside the Air Force S&T budget (for example, from other Air Force programs and from DARPA). What are you doing to ensure that the possible benefits of such leveraging are not canceled out by the negative risks that such leveraging incurs (such as funding instability and sudden changes in direction)?

General NIELSEN. To ensure the benefits realized by the Air Force in leveraging resources outside the Air Force Science and Technology (S&T) Program are not negated by potential risks, such as funding instability and changes in direction, the Air Force uses Memoranda of Understanding and/or Agreement to establish each parties' respective roles and responsibilities. These memoranda, usually signed at a high level within each organization, spell out exactly what is expected of each party. This coupled with the excellent symbiotic relationships that the Air Force Research Laboratory enjoys with a multitude of organizations, including the Defense Advanced Research Projects Agency, has enabled the Air Force to enjoy the many benefits possible from leveraging without incurring undue risks.

Mr. WELDON. What is the current state of AFRL's scientist and engineering workforce? In terms of sizing and quality, has it improved in recent years, gotten worse, or stayed the same? Is there an S&E workforce "crisis" as far as you're concerned? What Air Force or OSD action do you see that will affect AFRL's workforce? Will the effects be positive or negative?

General NIELSEN. The current state of the Air Force Research Laboratory's (AFRL's) Scientist and Engineer (S&E) workforce is excellent due to the many recruiting and retention efforts that have been enacted over the past few years, thereby alleviating the strain on the workforce. While AFRL's S&E civilian manpower has decreased approximately 13 percent since 1998, end-strength is expected to stabilize at its current level of about 2,500. This period has also seen improvements in the quality of S&E employees as a result of AFRL's Laboratory Personnel Demonstration Project—also known as Lab Demo. Lab Demo has successfully combined a simplified job classification system, broad payband levels, and contribution-based compensation to enable AFRL to manage its S&E workforce and properly compensate high contributors. At present, there is no S&E workforce crisis in the laboratory.

With respect to Air Force or Office of the Secretary of Defense (OSD) actions that may affect AFRL's workforce, one of the main near-term actions is implementation of the National Security Personnel System (NSPS) and the Best Practices Demonstration Project. The Air Force supports these efforts and is working with OSD to retain the types of flexibilities currently enjoyed by AFRL.

Mr. Weldon. The other services appear to use fewer uniformed scientists and engineers in their S&T labs than the Air Force does. The Secretary of Defense has described the need to reassign military personnel out of jobs that should be performed by civilians. In this environment, do you believe a strong case for assigning uniformed S&Es to AFRL?

General Nielsen. The Air Force Research Laboratory's (AFRL's) military officers and enlisted members are an indispensable element of its workforce. They provide both constant technical refreshment and mobility, bringing an operational perspective not achievable with either permanent civilian employees or other "agile" elements, such as temporary employees or collaborators. In fact, recommendations contained in a 1998 Defense Science Board Task Force on Defense Science and Technology Base for the 21στ Century for increased workforce agility led to a subsequent Air Force study called "Science and Technology Work Force for the 21στ Century" or STW–21, which proposed a workforce mix to include 15 percent uniformed military members. AFRL is implementing STW–21 recommendations as approved by the Secretary and Chief of Staff of the Air Force.

This military presence in AFRL provides the Air Force a unique combination of technical expertise and operational experience, which provides a strategic view that cannot be gained via simulations or observations. This cadre of military S&Es is also the critical seed corn for the senior military leadership of the future, which needs, within its ranks, members who have a particular vision for the application of technology to the warfighter community. This is achievable only with solid laboratory experience. In addition, advances in revolutionary "game changing" technologies, such as stealth, directed energy, sensors, night vision, munitions, C4I [command, control, communications, computing, and intelligence], and space vehicles have resulted directly from the significant presence of military members in AFRL. Many of these advances have been achieved during wartime and would have been impossible without significant numbers of military members already positioned in the laboratory environment.

Mr. Weldon. The FY 2002 Defense Authorization Act stated that the Air Force should, at least once every 5 years, conduct a review of the longterm challenges and short-term objectives of the Air Force science & technology programs that is consistent with the review specified in section 252 of the FY 2001 Defense Authorization Act. A recent National Research Council report recommended that the Air Force align its S&T planning framework to the current Air Force strategic planning process by using the ConOps framework. How do AFRL's "warfighter technology areas" fit into this framework?

General Nielsen. The Air Force has fully embraced the concept of "capability-based planning" and is using the Concepts of Operations (CONOPS) framework to implement the new strategic planning process. The Air Force Research Laboratory's (AFRL's) Warfighter Technology Areas (WTAs) are based on the Long-Term Challenges (LTCs) and the Short-Term Objectives (STOs) identified in the Science and Technology (S&T) Planning Review. In addition, the CONOPS framework provided a significant input in the definition of AFRL's WTAs. Over the past 21 months, this process has matured into a viable means of performing corporate planning and programming activities. Throughout this period, the Air Force has continued to validate this construct against the CONOPS framework and the LTCs and STOs strategic planning activities.

Mr. Weldon. General Nielsen, your labs have responsibilities in all five of President Bush's federal R&D priorities for the fiscal year 2005. These include: R&D for combating terrorism; nanotechnology; networking and information technology; molecular level understanding of life's processes; and, R&D for environment and energy. Do you have the resources to adequately fund these technology areas?

General Nielsen. The Air Force Science and Technology (S&T) Program invests in generic technologies in air and space mission areas, which could be applicable to

President Bush's federal research and development priorities. The Air Force S&T Program has sufficient resources to adequately fund those technologies necessary for future air and space warfighting capabilities.

Mr. WELDON. General Nielsen, a number of aerospace industry leaders have contacted Congress regarding their concerns of the threat to U.S. Global Positioning System leadership because of the proposed European Galileo GPS. Do you share their concerns? Can you describe where we are in terms of GPS III in terms of schedule and funding?

General NIELSEN. AFRL is aware of the technical issues associated with Galileo; however, since acquisition responsibility for GPS falls under the Office of the Under Secretary of the Air Force, we collaborated with them to provide an answer.

The Department of State, in coordination with the National Security Council, Department of Defense, Department of Transportation, and other civil agencies, has been negotiating with the European Union to ensure National Security and trade equities are not negatively affected by the Galileo System. We are confident that bilateral negotiations will yield a mutually beneficial agreement.

GPS III is fully funded in the FYDP with a planned first launch in FY12 and final operational capability in FY17. The long standing AFRL and GPS Joint Program Office partnership in applied research and development serves to ensure that new GPS III techniques and challenges posed by co-existence with Galileo are addressed for aircraft, munitions, and space vehicles.

## QUESTIONS SUBMITTED BY MR. TURNER

Mr. TURNER. A recent study by the National Research Council (NRC) of the National Academies found, "The Air Force is a long way from having viable development (capability) planning." This type of planning is critical to successful S&T investment for meaningful warfighting capability and to our national defense. The study recommended, "The Air Force should institute a strong crosscutting development/capability planning organization staffed by experienced individuals with broad backgrounds and in-depth expertise." Moreover, Section 252(b) of the National Defense Authorization Act for Fiscal Year 2002 (Public Law 107–107) stated: "The Secretary of the Air Force shall reinstate and implement a revised development planning process. . ." What is the Air Force doing to implement Section 252(b) and to institute a viable development planning process? What additional steps should the Air Force take that it is not doing now? What steps should Congress take to support the Air Force's efforts to implement the NRC recommendation?

General LYLES. The Air Force has shifted from a threat-based approach to a capabilities-based approach to making investment decisions and providing for requirements generation planning. The CSAF has rapidly advanced this vision towards Concepts of Operations (CONOPs) based on capabilities. The Air Force recently began a Capabilities Review and Risk Assessment (CRRA) process to examine these CONOPs capabilities, to identify shortfalls in current and future programmed capabilities, and then to assess the risk in terms of the Air Force's ability to deliver those battlefield effects now and in the future. The "capability gaps/shortfalls" resulting from this risk assessment will play a key role in the new Capabilities-Based Planning Process. All the Enterprise product areas, AFRL, and the MAJCOMs will participate in addressing these gaps and identifying potential solution sets. The Enterprise Leadership construct is intended to capitalize on, expand, and coordinate basic analysis capabilities existing in the Product Centers to support Capability-Based Planning. Development planning (now called Capability Planning) will be a vital and fully integrated part of this new Capability-Based Planning Process. In addition to the CRRA process, the Air Force in 1999 added and has matured a powerful tool in its planning arsenal by establishing the Applied Technology Council (ATC) process. This forum engages AFRL, the appropriate Enterprise Commander representing one of AFMC's three Enterprise product areas (Aeronautical, Armament or Command and Control), and the appropriate MAJCOM Vice-Commander (or Commander in the case of the Air Force Special Operations Command). The ATC process coordinates the needs of Air Force warfighters into Science and Technology investment decisions, allowing them to provide input into the establishment of priorities.

Focused efforts across the Air Force need to be made to improve existing capabilities. The Enterprise Leadership construct will be the key to our success in this area. The Air Force's new Capabilities Based Planning (CBP) process will require strong participation from each of the Enterprise Commanders and their integration capabilities. The Air Force's new Capabilities Based Planning process is systemic and will be funded using existing Air Force resources. As such, however, it is difficult to estimate how much this process "costs." As an integral part of the CBP process, development planning will be provided for as required, but it is unclear at this time how much this will equate to on an annual basis. Funding will be needed to allow viable technology assessments, concept development & evaluation, as well as warfighter utility studies. AFMC will be addressing their resource needs in the upcoming FY06 Program Objective Memorandum (POM) budgeting process.

Congress can ensure that operating funds for key analysis and planning organizations are sufficient to address, in a timely and proactive fashion, the critical shortfalls identified in the CRRA process and provide innovative and integrated options sets to meet those shortfalls.

Mr. TURNER. Approximately 8 percent of the AF S&T request is for the National Aerospace Initiative (NAI). Some Members of Congress are concerned that the Air Force's overall NAI strategy suffers from poor program description, insufficient budget justification, and the lack of Future Year Defense Plan (FYDP) funding for NAI and Advanced Aerospace Propulsion. This has resulted in recommendations for significant funding reductions. Please explain the importance of NAI and describe your plan to respond to the criticism that the program lacks a clearly defined goal that addresses the overall initiative.

General NIELSEN. The Air Force supports the objectives of the DDR&E (Director, Defense Research and Engineering) National Aerospace Initiative (NAI). The Air Force core Science and Technology (S&T) Program addresses each of the three pillars of DDR&E's NAI effort. These pillars include hypersonics, space access, and space technologies. The core Air Force S&T efforts that could enable achieving the technical program objectives of DDR&E's NAI effort are clearly defined and adequately invested in each of these three areas. Although the criticism suggests a poorly structured initiative on the part of DDR&E, the Air Force technologies that underpin this initiative are critical to future Air Force warfighting capabilities and it would be our hope that Congress will not jeopardize this work because it is related to NAI.

Mr. TURNER. For many years, there has been discussion of consolidating the management of S&T across the services. This effort has been accelerated with consideration of merging and reducing the number of the service laboratories. Could you address the capability of the Air Force Research Laboratory to handle more joint work that could benefit all the services?

General NIELSEN. The Air Force Research Laboratory (AFRL) has a proven track record in managing joint-Service research activities and has the expertise to handle additional joint efforts in our assigned mission area of responsibility, provided additional resources—both personnel and funding—were available to support these efforts. In addition, the Air Force Science and Technology (S&T) Program is focused on developing technologies that address future warfighting capability needs, specifically those in the areas of air and space. These technologies are generic in nature and could be applicable for use by one or more of the other Services and Defense Agencies. However, consolidation of S&T management across the Services would be very difficult to achieve without a significant decrease in our ability to support warfighter needs. Further, there is no structure or process to accomplish this and it would take between three and five years to put something in place with resultant potential management efficiencies most likely negated by the adverse impact caused by this action.

Mr. TURNER. Using computers for modeling and simulation shows great promise for saving time and money in developing new weapons systems. What actions is the Air Force taking to assure more rapid technology transition in this area? The Defense Science Board recommended increase operational experimentation and spiral development. Describe the role of the Major Shared Resource Center in simulation-based research and experimentation and the efforts the Air Force has underway to improve acquisition modeling and simulation.

General NIELSEN. The Air Force has an office to establish and manage modeling and simulation (M&S) policy and standards. This office is important in the transition of advanced M&S technologies from the laboratory to actual use in the acquisition process. Advances in M&S enable operators and technologists to increase experimentation at all levels of the weapon system life cycle. The Air Force Research Laboratory (AFRL) uses over 150 models and simulations to support various Science and Technology (S&T) efforts. The AFRL Technical Directorates use flexible M&S tools that range from virtual simulations involving humans-in-the-loop to complex physics analyses such as nano-scale structural analysis of materials. These simulations enable the optimization of designs, driving down costs and advancing the development cycle. Further, spiral development approaches, used for weapon systems such as the Joint Strike Fighter, enable designers to incrementally test and integrate technologies.

In addition, the Department of Defense High Performance Computing Modernization Program is a major element in the transition of M&S technologies. The Major Shared Resource Centers (MSRCs) funded in this program provide government, industry, and universities the capability to do high-speed throughput computing. The MSRCs play an integral part in supporting operational experimentation and acquisition spiral development.

Mr. TURNER. With major acquisition programs increasingly managed by joint program offices, describe the future role AFRL will play to continue to develop new technologies for joint programs.

General NIELSEN. The increased use of joint programs is not expected to change the current role of the Air Force Research Laboratory (AFRL) with respect to developing new technologies for Air Force or joint applications. AFRL develops technologies that address future warfighting capability needs. These technologies are generic in nature and could readily transition into a dedicated Air Force system or into a joint program system.

Mr. TURNER. With the high costs of developing new weapons systems, the Air Force is looking toward keeping the old fleet running longer and longer to save money. Describe the cost savings and the increased readiness of aging aircraft that have resulted from establishing the Aeronautical Enterprise Program Office.

General NIELSEN. The Aeronautical Enterprise Program Office (AEPO) has realized success in both improving aircraft readiness and decreasing support costs. AEPO efforts resulted in the avoidance of approximately $38 million in maintenance labor over five years for inspection of the fasteners for the inner wing surface of the C–141 aircraft. Also, by modifying the certification process, the AEPO created a $50 million, one time avoidance in unbudgeted costs for the KC–135 program when implementing the internationally-mandated Global Air Traffic Management subsystem. Additional opportunities created for avoiding costs or decreasing maintenance hours include: Material Substitution of Corrosion Prone Alloys with $200 million projected avoidance in material and labor costs for the C–130 and KC–135 aircraft; Detection of Thinning Due to Corrosion with $55 million projected avoidance in labor costs over ten years for the KC–135 and E–3 aircraft; Non-Destructive Inspection of Multi-Layer Structure with $65 million (one time) projected avoidance in labor costs for inspection of the B–1's wing carry-through structure and $30 million (one time) in the same aircraft's wing splice; and, the Retrogression and Reaging of Aluminum Alloys with projected avoidance of $160 thousand per C–130 via a process that allows a re-heat treat of existing aluminum structures to reduce susceptibility to corrosion without decreasing the load carrying ability of the part.

Aircraft readiness is determined by two variables: a unit's mission capable (MC) rate and the total number of unit assigned aircraft available at any one time to accomplish the unit's mission. The top two drivers for non-mission capable aircraft are lack of readily available spare parts in the supply chain and the lack of properly trained maintenance technicians on the flight line and in the maintenance back shops. The Productivity, Reliability, Availability, and Maintainability (PRAM) program, managed under the AEPO, was intended to support both aspects of aircraft readiness and emphasized rapid incorporation of commercial off-the-shelf or emerging technologies to increase the reliability and maintainability of existing aircraft. PRAM projects address increased reliability and decreased flight line/back shop maintenance time for failed aircraft components. Decreasing the time an aircraft is in maintenance increases the unit's MC rate and also the number of MC aircraft available to the unit. One successful PRAM effort that resulted in increasing readiness, while decreasing costs, tested an anti-corrosion spray for use on avionics connectors and made it available to the flight line/back shop, thereby decreasing the number of times that avionics boxes failed and were turned in for repair due to corrosion on the pins. If all Air Force units implemented this action, it is projected to save about $10 million in labor and $250 million in maintenance charges for testing avionics boxes that are actually functional. Another aspect of PRAM is increased productivity. For example, two PRAM projects, the Automated Weight and Balance System and the Automated Form F Generator, allow operational units to calculate aircraft weight, center of gravity, certify munitions configurations, and generate the required paperwork in about 15 minutes versus more than an hour as required by the previous pencil, paper, and hand-held calculator method.

In addition, the AEPO currently has a number of projects ongoing to reduce the time aircraft spend in depot maintenance, thereby increasing readiness. Both the Enhanced Equipment to Inspect for Material Thinning and the Mobile Automated Scanner Implementation for Corrosion and Crack Detection efforts are expected to result in faster and more thorough depot-level structural inspections; the implementation of the scanner is projected to avoid over 280 hours per inspection for the B–52 alone and is projected to save more than $11 million over ten years. As the system is used on other aircraft, additional savings in labor hours will also accrue. Also, the Advanced Corrosion Protection project will likely decrease the extent of corrosion damage that typically needs to be addressed during depot maintenance.

The AEPO is restricted to prototyping and transitioning technologies, which provide the opportunity for the using commands and the air logistics centers to implement and reap the benefits. The results of the depot efforts detailed above will not be visible until after implementation. It should be noted, however, that while the Air Force is maintaining its aging aircraft fleet through the efforts of the AEPO in an attempt to save money in the near-term, eventually the cost of doing so—in dollars, time, and safety—will no longer be feasible and these aircraft will have to be replaced.

Mr. TURNER. A recent study by the National Research Council (NRC) of the National Academies noted, "A serious, thorough, and competent effort to educate the [Air Force] officer corps on the history, value, and necessity for S&T may be the most fruitful investment in the long term." What is the Air Force doing to provide future Air Force planners and leaders with an appreciation of the link between S&T and operational military capabilities?

General NIELSEN. We are confident that sufficient opportunities exist to instill an appreciation and understanding of the link between Science and Technology (S&T) and operational military capabilities. From its inception, the Air Force has prided itself on being a high technology-oriented organization. In fact, the S&T community takes every opportunity to tell the S&T story to Air Force operators. Activities such as the Applied Technology Councils (ATCs) bring together acquisition product centers, logistics centers, major user commands, and lab personnel to review and discuss S&T programs. ATCs foster top-level user involvement in the transition of technology from the lab to the system developer to the operational user. In addition, S&T is now a formal part of the Air Force Capabilities Review and Risk Assessment (CRRA) process. The CRRA process involves several levels of Air Force leadership, including the Chief of Staff, and further promotes a greater understanding within the Air Force of the S&T Program and its link to warfighting capabilities. Further, Professional Military Education courses offered at the Air Force Institute of Technology are being strengthened to better highlight the importance of S&T to the warfighter and operational capabilities. The Air Force's Scientist and Engineer (S&E) Concepts of Operations, approved by the Secretary of the Air Force, also reflect the requirement for technical competence in our senior leadership and Air Force career tracks are stressing this in their senior leadership preparation, which includes both military and civilians.

Finally, the Air Force workforce mix of S&Es includes approximately 15 percent uniformed military personnel. This military presence provides the Air Force a unique combination of technical expertise and operational experience. This cadre of military S&Es is also the critical seed corn for the senior military leadership of the future, which needs, within its ranks, members who have a particular vision for the application of technology to the warfighter community.

Mr. TURNER. The Air Force S&T budget request this year includes projects, which were, moved from other accounts into the Air Force S&T accounts. It also includes projects that would not traditionally be considered S&T. These changes in accounting creates the impression that the proposed Air Force S&T account for fiscal year 2004 has increased substantially over last year's Air Force S&T request. What level of funding is there for traditional Air Force S&T programs in fiscal year 2004, and what are the comparable funding levels in fiscal year 2001, 2002, 2003, in both current and then-year dollars (excluding nontraditional Air Force S&T programs and programs devolved from other accounts)?

General NIELSEN. The Fiscal Year 2004 President's Budget (PB) request for the Air Force Science and Technology (S&T) Program totals $2,197 million. Subtracting the $355 million in funding stemming from the programs the Office of the Secretary of Defense devolved to the Air Force brings this number down to $1,842 million. If you then subtract the $370 million included for Special Programs, which have only been counted in the S&T Program for the past two years, the Fiscal Year 2004 PB request for "traditional" S&T efforts totals $1,472 million. Comparable funding in Fiscal Years 2001-2003 is $1,174 million, $1,379 million, and $1,367 million, respectively. When converting these Then Year dollars into Constant Year 2004 dollars, Air Force S&T funding totals $1,205 million in Fiscal Year 2001, $1,403 million in Fiscal Year 2002, $1,376 million in Fiscal Year 2003, and $1,460 million in Fiscal Year 2004.

Mr. TURNER. The Air Force S&T budget request recommends $757.9 million for the Applied Research ("6–2 account"), an 8.6 percent reduction below last year's appropriated level of spending for this account. Much of the basic operating expenses for the Air Force Research Laboratory, including personnel, come out of this account. What will be the effect of this cut on the operations of the laboratory?

General NIELSEN. The Air Force has worked hard to maintain a balanced Science and Technology (S&T) portfolio and our Fiscal Year 2004 President's Budget (PB) requested amount of $2,197 million provides for the technology development essential for the Air Force vision of an Expeditionary Air and Space Force. This includes $758 million for 6.2, Applied Research efforts-an increase of $60 million over the Fiscal Year 2003 PB request, which equates to seven percent real growth. Although the civilian pay portion of this Applied Research funding goes down $20 million, this is the result of a bookkeeping change vice an actual decrease in civilian pay funding. Per Congressional direction, civilian health care and life insurance funding for retirees was transferred back into the centrally-managed account from which it had come the previous cycle. The "decrease" between the Fiscal Year 2003 appropriated amount for Applied Research and that requested in the Fiscal Year 2004 PB will not affect laboratory operations, since the Air Force does not base the planning, programming, and budgeting of its S&T Program on prior year Congressional Add funding.

Mr. TURNER. A recent study by the National Research Council (NRC) of the National Academies found, "Problems within the Department of Defense's scientific and engineering (S&E) workforce have been aggravated in the past 15 years by policies that have adversely affected the workforce and resulted in a crisis in the Air Fore S&E military and civilian workforce." The study recommended that the Secretary of Defense implement the provisions of Section 1114 of the fiscal year 2001 National Defense Authorization Act to give laboratory directors more flexibility in shaping their workforces. The study also recommended, "The Air Force should conduct a comprehensive review of requirements for military and civilian S&E-trained people across the Air Force, including laboratories and system program offices, and establish a system for long-term management of the S&E workforce." What is the Air Force doing in response to these recommendations?

General NIELSEN. The Air Force has established the first ever Scientist and Engineer (S&E) Functional Authority led by the Assistant Secretary of the Air Force for Acquisition. The Functional Authority is responsible for the long-term management of the S&E workforce and this oversight of the health and care of the Air Force S&E workforce from recruitment to development to force management should address recommendations directed to the Air Force in the recent National Research Council (NRC) study. In addition, the S&E Career Field Functional Manager, led by the Assistant Secretary of the Air Force for Acquisition (Science, Technology and Engineering), recently completed both a Requirements Review and a Future Study to examine the current and future needs of the Air Force S&E workforce. As for the study's recommendation that the Secretary of Defense implement the provisions of Section 1114 of the Fiscal Year 2001 National Defense Authorization Act, the Air Force understands that this is on hold pending approval and implementation of the Best Practices Demonstration Project.

Mr. TURNER. Wright-Patterson has always been a special place for science research because so many science and engineering organizations are located all on the same base. Today, these include the Air Force Research Laboratory, the National Air Intelligence Center, and the headquarters for the Air Force Material Command. Can you address how these all work together to promote scientific research creating a synergistic whole that is greater than the sum of its parts?

General NIELSEN. Several methods are used to capitalize and leverage the very large and diverse force of scientific and engineering personnel assigned to Wright-Patterson Air Force Base, Ohio. Joint participation on various Integrated Process Teams and the routine exchange of scientists and engineers between the different organizations located at Wright-Patterson have proven to be a great way to cross-pollinate between these organizations, thus enhancing the synergy of the group. This is also a good way to provide career-broadening opportunities for both our civilian and assigned military personnel. In addition to the Air Force Research Laboratory (AFRL), the National Air Intelligence Center (NAIC), the Air Force Materiel Command (AFMC) Headquarters, and the Air Force Institute of Technology (AFIT) graduate school residents are also located at the base. As part of the AFIT graduate program, students are assigned to different technical organizations to work on their thesis and dissertation projects. This provides the opportunity for the students to use the latest research equipment and work beside technical experts, while enabling base organizations to augment their workforce with newly educated scientists and engineers. The free exchange of ideas encouraged by the collocation of these various organizations provides opportunities that might otherwise not materialize.

Mr. TURNER. In evaluating the value of a military base, the common denominator is often infrastructure. However, a much-overlooked value is intellectual capital.

This is particularly important for a base such as Wright-Patterson on the basis of intellectual capital, taking into consideration the number of employees with advanced educational degrees and who work in the scientific and technical fields, and the ability to take advantage of scientists at nearby major universities?

General NIELSEN. The Air Force Research Laboratory (AFRL) has approximately 2,500 permanent civilian Scientists and Engineers (S&Es) in its workforce, nearly 50 percent of whom reside and work in the Wright-Patterson local area. All of these employees have bachelor's degrees in technical fields and almost 70 percent have advanced degrees, either at the master's or doctoral levels. This is a very stable workforce, as a large number are originally from the local area and intend to stay here permanently. In addition, AFRL enjoys well-established collaborative relationships with local universities at all of the installations where we are located. These institutions are an extremely valuable resource and provide a source of graduating students who become new laboratory employees and graduate education opportunities for current laboratory employees. They also conduct extremely valuable research in support of Air Force science and technology efforts, enable exchange and internship opportunities for university faculty members and laboratory employees, and they even partner with AFRL in managing unique high value facilities. At Wright-Patterson, these schools include the Air Force Institute of Technology, University of Dayton, Wright State University, the Ohio State University, Central State University, Wilberforce University, the University of Cincinnati, and Cedarville University. Laboratory relationships with local universities are mutually beneficial to all involved and make substantial contributions to national defense, which would not otherwise be possible.

Mr. TURNER. In recent years, there has been discussion about making changes in the headquarters of Air Force Materiel Command (AFMC)—reducing its size, moving it, or even eliminating it. How would this affect Air Force science and technology?

General NIELSEN. The Commander of Air Force Materiel Command is the Air Force's four-star advocate for our science and technology program. He is also uniquely positioned to look across the breadth of Air Force capability requirements and the scores of technologies being developed at the Air Force Research Laboratory (AFRL) to ensure the warfighters' highest priority needs are being met. This is greatly facilitated by his active participation in the Applied Technology Council process. These semiannual, MAJCOM-specific meetings, insure stakeholder leadership is involved in technology maturation, and provide AFRL insight into which programs have MAJCOM funding for system or weapon system transition. We are not aware of any efforts to eliminate AFMC. If it was to happen, science and technology would lose the advantages of having a four-star advocate.

Mr. TURNER. A 2000 report of the Defense Science Board noted, "The focus of the current DoD S&T Program is primarily on incremental improvements in the current capabilities. While such incremental improvements are important, the current program does not place sufficient emphasis on innovative technologies initiatives leading to entirely new military capabilities." What is the Air Force doing to ensure that sufficient resources are directed to developing "revolutionary" technologies that could lead to dramatic advances in weapons systems as opposed to "evolutionary" technologies that provide only incremental advances?

General NIELSEN. The Air Force investment strategy for the Science and Technology (S&T) Program is to maintain a balance between evolutionary and revolutionary technologies. This is accomplished by maintaining a stable funding balance between Basic Research (6.1), Applied Research (6.2), and Advanced Technology Development (6.3). The investment split between evolutionary and revolutionary is based on input from a number of different and often independent technical experts. For example, the Air Force uses input from the Scientific Advisory Board, the National Research Council's Air Force Science and Technology Board, plus technical expert input from other Department of Defense (DoD) and non-DoD organizations in determining this balance. While there is no known scientific formula to guide this investment process, we believe we have the correct mix of investment in evolutionary and revolutionary technologies. Examples of revolutionary technologies funded within the Air Force S&T Program include solid state lasers, the pulse detonation engine, and microsatellites, just to name a few. In fact, a recent success story is the Active Denial technology developed by the Air Force and the Department of Defense Joint Non-Lethal Weapons Directorate. This revolutionary breakthrough non-lethal technology uses military-wave electromagnetic energy to stop, deter, and turn back advancing adversaries from a relatively long-range.

Mr. TURNER. General Nielsen, the Integrated High Performance Turbine Engine Technology (IHPTET)/Versatile Affordable Advanced Turbine Engine (VAATE) steering committee, which is made up of DoD and industry representatives, assumed a funding profile, and established technology demonstration goals, leading to new systems capabilities by 2010 for Long Range Strike; Uninhabited Vehicles; Intelligence, Surveillance, and Reconnaissance (ISR) resources; and Joint Strike Fighter (JSF) risk reduction. With the 40 percent decline in FY 2004 budget, what is the plan to meet these demonstration goals in FY 2004 and over the Future Years Defense Plan?

General NIELSEN. The Air Force has worked hard to maintain a balanced Science and Technology (S&T) portfolio and our Fiscal Year 2004 President's Budget (PB) request of $2,197 million provides for the technology development essential for the Air Force vision of an Expeditionary Air and Space Force. This includes $284 million for Propulsion S&T efforts—an increase of $40 million over the Fiscal Year 2003 PB request. Although there have been some reductions across the Future Years Defense Plan to the Integrated High Performance Turbine Engine Technology (IHPTET) and Versatile Affordable Advanced Turbine Engine (VAATE) programs, the Air Force is committed to maintaining a strong, balanced Propulsion S&T program with investments in turbines, rockets, and advanced air breathing engines.

Mr. TURNER. General Nielsen, the President's FY 2004 DoD budget request includes funding for the hypersonic-propulsion 'Endothermically Fueled Scramjet Engine Flight Demonstration,' also known as the Single Engine Demonstration (SED) project, however the Air Force has not included funding in the outyears for this critical technology. How is the Air Force planning to mature this technology and ensure that our men and women in the field reap the benefit of this investment as soon as possible? Further, if consistent investments are not made in these evolving hypersonic technologies, how does the Air Force intend to provide new hypersonic capabilities to address the changing battlefield environment?

General NIELSEN. The Air Force Science and Technology (S&T) program for hypersonic technology has concentrated on the development of hypersonic engines that use hydrocarbon fuels. The current hypersonic technology development plan is to jointly, through a coordinated Air Force and National Aeronautics and Space Administration (NASA) effort, flight test the Air Force hypersonic technology engine in conjunction with the NASA Hyper-X program (or X43C). However, another option would be for the Air Force to conduct the Single Engine Demonstration (SED), which could offer the opportunity to conduct a single engine/airframe configuration and reduce the risk of the three-engine X43C flight demonstration approach. This option is currently being evaluated by the Air Force and our long-term funding stream will be determined pending the completion of the Office of Secretary of Defense-directed Long Range Strike S&T Review and the Air Force's Operational Responsive Spacelift Study Analysis of Alternatives.

Mr. TURNER. General Lyles, the Joint Strike Fighter (JSF) program is the first fighter aircraft to be born in today's digital world. From initial concepts, engineering design, production and supply-chain management, avionics, flight-test data management, and in its operations, JSF is a fully digital aircraft, and a fully digital program.

As the JSF Test program continues to ramp up with engine testing at Arnold AFB in Tennessee this year, and then airframe testing as Edwards AFB in California, there will be an extraordinary amount of engineering, instrumentation, and telemetry data collected—perhaps more than a million gigabytes of data generated during initial flight testing. This massive amount of data will need to be managed, protected, and archived for the life of the JSF program to support government and contractor organizations around the world. My assumption is that building the IT infrastructure to support this will be no small task.

I am also aware that within AFMC you are making extraordinary strides at consolidating and modernizing your internal IT infrastructure, and as a result you are achieving great operational efficiencies in supporting the core services that allow Air Force Materiel Command to function and accomplish its mission.

As we all work to drive down costs for the benefits of the American Taxpayer, I look forward to the day when technology advances to the point where a single investment made to modernize your internal IT infrastructure, can also be leveraged to support the unique and extraordinary data requirements that a program such as JSF will create.

I am sure you have several people within the Air Force looking at this and wanted to see if you had any comments on this possibility?

General LYLES. Management of information has become central and increasingly pervasive element of all industrial, government, and military operations. This involves virtually every part of the organization as the need for accurate information is central to successful organizational processes. Information management is key to leveraging other capabilities, including people, and other systems and resources such as those necessary to support the Joint Strike Fighter (JSF) program and the associated requirements around a fully digital aircraft and program. Increasing the effectiveness of this weapon system through integrated information requires an information strategy that adapts to evolving needs. Technologies, architectures, and concepts of operations are evolving much faster than DOD planning and acquisition cycles and AFMC is transforming to address those needs. This transformation requires an AFMC information management strategy and associated information technologies and platforms that are dynamic, flexible, and adaptive to new requirements and opportunities. To this end, I have charged and empowered my AFMC Chief Information Officer (CIO), Mr Ken Percell, to be an advocate for new information technology (IT) programs that support the Air Force's information strategy and communicate clearly and effectively how corporate IT investments link to specific payoffs in enhanced mission capabilities such as the JSF. Included in his approach are leveraging leading edge/cutting edge technology programs and platforms within AFMC to support the unique and extraordinary data and information requirements that a program such as the JSF will create. To achieve these goals, AFMC must:

- — Support acquisitions with life-cycle concepts
  - — Simulation based acquisition investments
  - — Investing in models, simulation, and high-performance computing
  - — Leveraging IT for system life cycle as the JSF example proposes
- — Adapt new IT infrastructure concepts
  - — Electronic Data Warehousing (EDW) technologies
    - — Cross-functional and large scale
    - — Cross life-cycle/deep history
    - — Easily access terabytes
  - — Network-centric AF
    - — Capitalize on GIG–BE (Gigabyte Expansion) investment
    - — Connect the enterprise

## QUESTIONS SUBMITTED BY MR. MCHUGH

Mr. McHugh. How can we be assured that during the upcoming Base Closure and Realignment round, the Department of Defense will take into account the burgeoning cooperation between the labs, academia, and industry? Have steps been taken, or will steps be taken to recognize and quantify the inherent benefits to DoD that flow from this cooperation?

General Lyles. Please be assured that all military installations will be equally evaluated and all recommendations will be based on approved, published selection criteria and a force structure plan. While military value will be the prime consideration in reducing or restructuring United States military bases, the Department will also consider the ability of both existing and potential receiving communities' infrastructure to support forces, missions, and personnel among other factors.

Mr. McHugh. In considering the future of defense labs during the 2005 DoD base closure and realignment process or any other review, will the DoD take into consideration the enhanced need for quality information warfare research and related information technology that is needed to mitigate our critical infrastructure vulnerabilities?

General Lyles. Again, please be assured that all military installations will be equally evaluated and all recommendations will be based on approved, published selection criteria and a force structure plan. It is the Department's intent that, through the Base Realignment and Closure (BRAC) process, we will ensure that the United States continues to field the best-prepared capabilities-based Air Force in the world.

Mr. McHugh. In a 2001 report, the National Research Council found that "the Air Force S&T investment in information systems S&T is insufficient to meet emerging threats and to satisfy the Air Force's current visions for future warfighting." What steps has the Air Force taken to address these concerns?

General Lyles. The Air Force recognizes that the information systems technical area is a critical element for maintaining and improving future warfighter capability needs and has increased its Science and Technology (S&T) investment in information related technologies. In addition, the Air Force continues to leverage almost $500 million annually in extramural funding and is the executing agent for information technologies for organizations such as the Defense Advanced Research Projects Agency.

Mr. McHugh. Should the Air Force have a robust in-house S&T program in information systems to ensure effective transition of technology into Air Force systems? Please describe how AFRL, and in particular the Information Directorate, can meet the growing need for high quality, secure network systems in this era of netcentric warfare.

General LYLES. Yes, a robust in-house Science and Technology (S&T) capability is essential to the development of information technologies and their eventual transition into Air Force operational systems. This in-house capability is crucial to maintaining the expertise necessary for the evaluation of advanced information technologies and is sought after by other Air Force organizations, the Defense Advanced Research Projects Agency, the Missile Defense Agency, and the Intelligence community, among others, who bring almost $500 million to the table annually. In fact, the Air Force Research Laboratory's Information Directorate leverages these extramural resources with the Air Force's continuing investment in information technologies, such as advanced networking, information management, enterprise network management, and information assurance, to provide the warfighter with the capabilities required to combat the increased threat posed by network centric warfare.

Mr. MCHUGH. Numerous experts have expressed concerns about the recruitment and retention of world-class DoD and Air Force S&T personnel. Please describe what steps AFMC and AFRL are taking to recruit and retain scientists and engineers particularly in information systems engineering? How can a well-funded, world-class in-house S&T Air Force laboratory program help improve the Air Force's science and engineering workforce?

General LYLES. To assist in the recruitment and retention of a worldclass Scientist and Engineer (S&E) workforce, the Air Force Research Laboratory (AFRL) was the first laboratory in the Department of Defense (DoD) to implement legislation authorizing the use of alternative personnel management systems. In addition, the Air Force also supports DoD efforts to implement its Best Practices Demonstration Project and a National Security Personnel System and is working with DoD to retain the types of flexibilities currently enjoyed by AFRL.

The Air Force has taken several specific actions to assist in recruitment and retention of S&Es in all areas, including information. The Secretary and Chief of Staff of the Air Force have held two S&E Summits to address issues associated with Air Force S&Es and appointed the first ever S&E Functional Authority to oversee the health and care of the S&E workforce. In addition, the Air Force is investing more than $360 million across the Future Years Defense Plan in recruiting bonus and incentive programs, such as the Critical Skills Retention Bonus, Airman Education and Commissioning Program, Technical Degree Sponsorship Program for the Military, Recruiting Incentives for College Recruits, Co-op Central Funding, Robust College Recruitment Office, Recruiting Bonuses for Journey-Level, Retention Allowances for Journey-Level, and Group Retention Allowance for Civilians.

Finally, a well-funded, world-class, in-house S&T Program is crucial to enhancing recruitment and retention and will allow the Air Force to emphasize its commitment to providing the kind of environment where the S&E workforce has opportunities to push the limits of air and space in some of the world's best facilities for the finest Air Force in the world.

Mr. MCHUGH. Section 246 of the 1999 National Defense Authorization Act (P.L. 105–261) provides three-year pilot programs to revitalize the service laboratories by waiving many of the restrictions regarding personnel recruiting and hiring. How is AFRL implementing this provision? Is the AFRL Information Directorate participating in any pilot programs envisioned by Section 246?

General LYLES. The Air Force selected the Air Force Research Laboratory (AFRL) Space Vehicles Directorate to propose waivers under Section 246 of the Fiscal Year 1999 National Defense Authorization Act (NDAA) and this was done on a small scale. The AFRL Information Directorate was later selected to participate under similar legislation contained in Section 245 of the Fiscal Year 2000 NDAA; however, this was never implemented due to the Office of the Secretary of Defense (OSD) General Counsel's interpretation of limitations imposed by this section. Only about two percent of laboratory initiatives defense-wide were implemented under the pilot authority and the program is currently inactive pending Congressional renewal and OSD implementation guidance.

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